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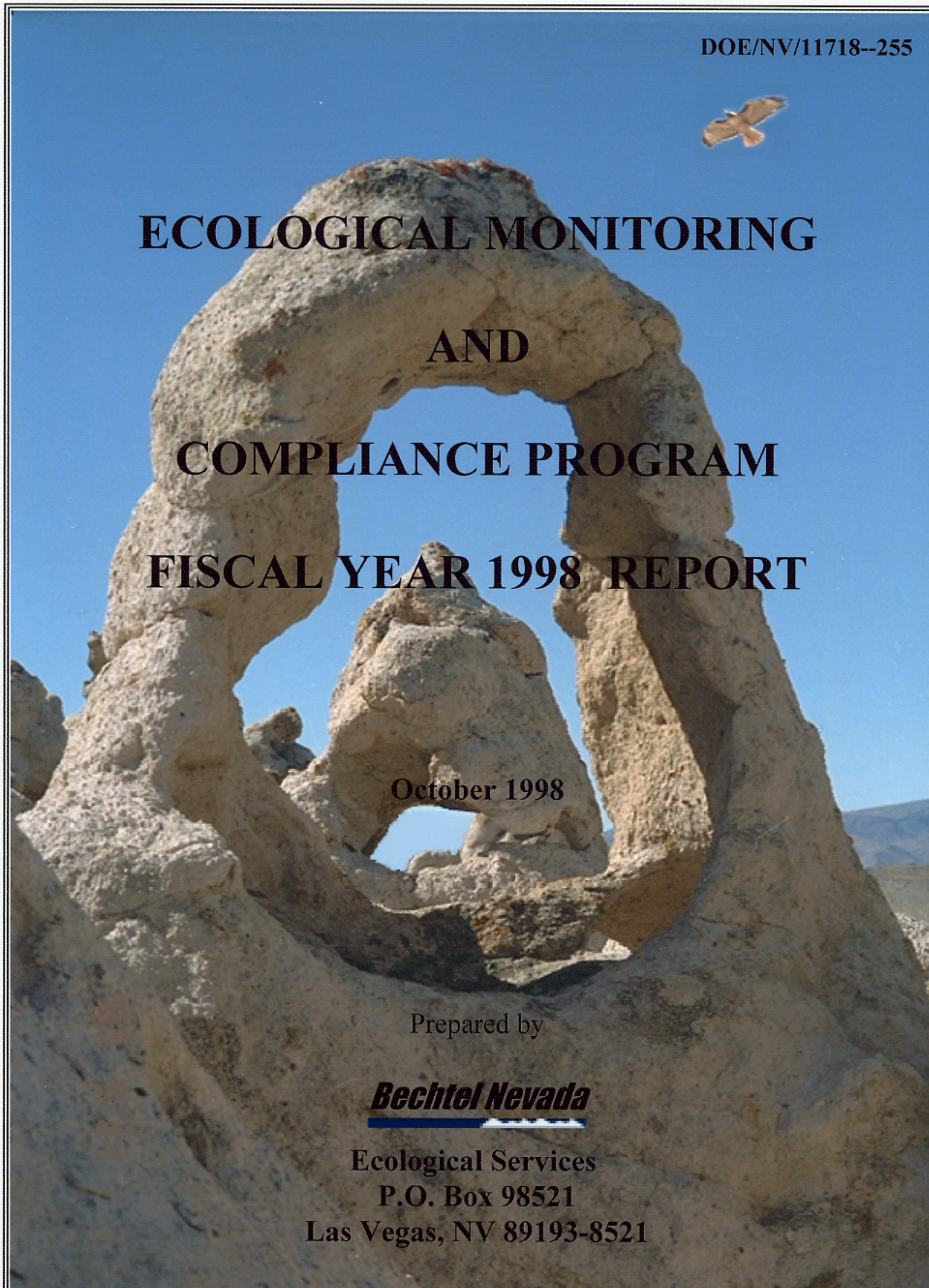

# ECOLOGICAL MONITORING AND COMPLIANCE PROGRAM FISCAL YEAR 1998 REPORT

October 1998

Prepared by

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# ECOLOGICAL MONITORING AND COMPLIANCE PROGRAM FISCAL YEAR 1998 REPORT

October 1998

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Prepared for the
U.S. Department of Energy
Nevada Operations Office
Environment, Safety, and Health Division
P.O. Box 98518
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# LIST OF ACRONYMS

| | |
|---|---|
| ac | Acre(s) |
| ASER | Annual Site Environmental Report |
| BLM | U.S. Bureau of Land Management |
| BN | Bechtel Nevada |
| CWA | Clear Water Act |
| DO | Dissolved Oxygen |
| DOE | U.S. Department of Energy |
| DOE/NV | U.S. Department of Energy, Nevada Operations Office |
| EGIS | Ecosystem Geographic Information System |
| ELU | Ecological Landform Unit |
| EMAC | Ecological Monitoring and Compliance |
| ESA | Endangered Species Act |
| ESHD | Environment, Safety, and Health Division |
| ft | Foot/feet |
| FWS | U.S. Fish and Wildlife Service |
| FY | Fiscal Year |
| GIS | Geographic Information System |
| ha | Hectare(s) |
| HAZMAT | Hazardous Materials |
| kHz | Kilohertz |
| km | Kilometer(s) |
| L/min | Liter(s)/minute |
| m | Meter(s) |
| mi | Mile(s) |
| NAFR | Nellis Air Force Range |
| NDOW | Nevada Division of Wildlife |
| NERP | National Environmental Research Park |
| NNNPS | Northern Nevada Native Plant Society |
| NTS | Nevada Test Site |
| ppm | Part(s) per million |

## LIST OF ACRONYMS (continued)

| | |
|---|---|
| RMP | Resource Management Plan |
| TDS | Total Dissolved Solids |
| UGTA | Underground Test Area |
| UNLV | University of Nevada, Las Vegas |
| USGS | U.S. Geological Survey |
| ZOI | Zone-of-Influence |

# ABSTRACT

The Ecological Monitoring and Compliance program, funded through the U. S. Department of Energy/Nevada Operations Office, monitors the ecosystem of the Nevada Test Site (NTS) and ensures compliance with laws and regulations pertaining to NTS biota. This report summarizes the program's activities conducted by Bechtel Nevada (BN) during fiscal year 1998. Twenty-one sites for seven projects were surveyed for the presence of state or federally protected species. Three projects were in or near habitat of the threatened desert tortoise and required special clearance and transect surveys. Northern NTS was partitioned into ecological landform units using aerial photographs and ground-truthing surveys. Vegetation and habitat data were collected at 550 ecological landform units, completing habitat mapping of the NTS. Surveys were completed which identify the NTS distribution and range of Clokey's eggvetch, a candidate plant for listing under the Endangered Species Act. Field surveys verified that the Blue Diamond cholla, a candidate plant, does not occur on the NTS. Sitewide inventories were conducted for the western burrowing owl, six bat species, wild horses, and raptor nests. Surveys verified that burrowing owls, which are known to migrate, occur year-round on the NTS and that the small-footed myotis bat occurs on the NTS. Maps showing the revised distribution and range of these plants and animals on the NTS are presented. Wetlands and man-made water sources were monitored for wildlife use, and three new springs were discovered. A revised map showing the 28 known natural water sources of the NTS is presented. Three chemical spill test plans were reviewed for their potential to impact biota downwind of spills on Frenchman Lake playa. All geospatial data collected were entered into Bechtel Nevada's Ecological Geographic Information System for use in ongoing ecosystem management of the NTS.

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# 1.0 INTRODUCTION

The Environment, Safety, and Health Division (ESHD) of the U.S. Department of Energy, Nevada Operations Office (DOE/NV) provides ecological monitoring and biological compliance support for programs conducted at the Nevada Test Site (NTS). ESHD has implemented the Ecological Monitoring and Compliance (EMAC) program to provide this support. EMAC is designed to ensure compliance with applicable laws and regulations, delineate and define NTS ecosystems, and provide ecological information that can be used to predict and evaluate the potential impacts of proposed projects and programs on those ecosystems.

In 1996, Bechtel Nevada (BN) Ecological Services developed an internal guidance document entitled *Guiding Principles and Prioritization Criteria for Ecological Monitoring at the Nevada Test Site*. This document, approved by ESHD, identifies multiple ongoing, as well as unfunded, monitoring tasks. The document describes a priority ranking system by which these tasks are evaluated each fiscal year (FY) and assigned a rank of either high, medium, or low priority. The priority status of a task is based on its (1) usefulness in achieving regulatory compliance, (2) responsiveness to stakeholder goals and objectives, (3) degree of current completeness, (4) complexity of activity and amount of effort needed to complete, (5) cost of implementation, and (6) the criticality of current versus future implementation.

The ecological monitoring tasks which were assigned high or medium priority and were conducted in FY 1998 (October 1, 1997 through September 30, 1998) included: (1) Biological Surveys, (2) Desert Tortoise Compliance, (3) Ecosystem Mapping, (4) Sensitive Species and Habitat Monitoring, and (5) Hazardous Materials (HAZMAT) Spill Center Monitoring. This report documents work conducted by BN Ecological Services within these four program areas during FY 1998. Support was also provided to National Environmental Research Park (NERP) investigators using the NTS, as well as to ESHD for EMAC project control, and these efforts are documented in this report under the task title of General Biological Support.

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# 2.0 BIOLOGICAL SURVEYS

## 2.1 Task Description

Biological surveys are performed at proposed NTS project sites where land disturbance will occur. The goal is to minimize negative impacts of land disturbance on sensitive plant and animal species, their associated habitat, and important biological resources. Sensitive species include those protected under state or federal regulations which are known or suspected to occur on the NTS (Table 1). Important biological resources include such things as cover sites, nest or burrow sites, roost sites, or water sources important to sensitive species. Biological surveys are also a required mitigation measure under the Mitigation Action Plan for the *Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada* (U.S. Department of Energy [DOE], 1996). Survey reports are written to document species and resources found and to provide mitigation recommendations.

## 2.2 Task Progress Summary

Biological surveys for seven programs were conducted on or near the NTS (Figure 1). For two of the programs, multiple sites were surveyed. Twelve groundwater characterization well sites were surveyed in support of the Underground Test Area (UGTA) program. The names of the sites are listed below. The ER-EC well sites are located on the Nellis Air Force Range (NAFR), the ER-18-2 well site is on the NTS, and the ER-OV well sites are on land managed by the U.S. Bureau of Land Management (BLM).

UGTA Well Sites Surveyed

| | | |
|---|---|---|
| ER-EC-2A | ER-EC-6 | ER-EC-10 |
| ER-EC-3 | ER-EC-7 | ER-18-2 |
| ER-EC-4 | ER-EC-8 | ER-OV-7 |
| ER-EC-5 | ER-EC-9 | ER-OV-8 |

Four sites where stay-out fences were installed were surveyed in support of the Radiation Demarcation program. They included the Area 9 Windrows, Plutonium Valley safety shot sites, an Area 8 contaminated site created by the Smoky test, and the Area 18 Little Feller I site. A total of 1,886.25 hectares (ha) (4,660.92 acres [ac]) were surveyed for the seven projects (Table 2).

Only one of the biological surveys was within the range of the threatened desert tortoise (*Gopherus agassizii*) (Figure 1). Sensitive species (or their sign) and important biological resources found within proposed project boundaries included raptor or raven nests, predator burrows, and Joshua trees (Table 2). No candidate species or species of concern were found. BN wrote six biological survey reports (BN, 1998c; h; j; l; n; q) with recommendations to minimize construction and operating impacts, where appropriate (Table 2).

**Table 1. Sensitive species which are protected under state or federal regulations and are known to occur on the Nevada Test Site**

| Plant Species | Common Name | Status[a] |
|---|---|---|
| *Arctomecon merriamii* | White bearpoppy | <C2, N, FS |
| *Astragalus beatleyae* | Beatley milkvetch | <C1, CE |
| *Astragalus funereus* | Funeral Mountain milkvetch | <C2, N, FS |
| *Astragalus oopherus* var. *clokeyanus* | Clokey's egg-vetch | C, FS, CE# |
| *Camissonia megalantha* | Cane Spring evening primrose | <C2, N |
| *Cymopterus ripleyi* var. *saniculoides* | Sanicle biscuitroot | <C2, N |
| *Frasera pahutensis* | Pahute Mesa green gentian | <C2, N |
| *Galium hilendiae* ssp. *kingstonense* | Kingston bedstraw | <C2, N |
| *Penstemon albomarginatus* | White-margined beardtongue | <C2, N |
| *Penstemon fruticiformis* var. *amargosae* | Death Valley beardtongue | <C2, N, FS |
| *Penstemon pahutensis* | Pahute Mesa beardtongue | <C2, N |
| *Phacelia beatleyae* | Beatley phacelia | <C2, N |
| *Phacelia parishii* | Parish's phacelia | <C2, N |
| Members of the Agave Family | Yuccas | CY |
| Members of the Cactaceae Family | Cacti | CY |
| **Reptile Species** | | |
| *Gopherus agassizii* | Desert tortoise | LT, NPT |
| *Sauromalus obesus* | Chuckwalla | <C2 |
| **Bird Species**[b] | | |
| *Alectoris chukar* | Chukar | G |
| *Aquila chrysaetos* | Golden eagle | EA, P |
| *Buteo regalis* | Ferruginous hawk | <C2, P |
| *Callipepla gambelii* | Gambel's quail | G |
| *Charadrius montanus* | Mountain plover | C |
| *Falco peregrinus anatum* | American peregrine falcon | LE, NPE |
| *Haliaeetus leucocephalus* | Bald eagle | LT, EA, P |
| *Ixobrychus exillishesperis* | Least bittern | <C2 |
| *Lanius ludovicianus* | Loggerhead shrike | <C2 |
| *Plegadis chihi* | White-faced ibis | <C2, P |
| *Speotyto cunicularia* | Western burrowing owl | <C2, P |

**Table 1 (Continued)**

| Mammal Species | Common Name | Status[a] |
|---|---|---|
| *Antilocapra americana* | Pronghorn antelope | G |
| *Equus asinus* | Burro | H&B |
| *Equus caballus* | Horse | H&B |
| *Euderma maculatum* | Spotted bat | NPT |
| *Felis concolor* | Mountain lion | G |
| *Lynx rufus* | Bobcat | F |
| *Myotis evotis* | Long-eared myotis | <C2 |
| *Myotis thysanodes* | Fringed-myotis | <C2 |
| *Myotis volans* | Long-legged myotis | <C2 |
| *Ovis canadensis nelsoni* | Bighorn sheep | G |
| *Odocoileus hemionus* | Mule deer | G |
| *Plecotus townsendii pallescens* | Pale Townsend's big-eared bat | <C2 |
| *Sylvilagus audubonii* | Desert cottontail | G |
| *Vulpes velox macrotis* | Kit fox | F |

[a]Status Codes:

Endangered Species Act, U.S. Fish and Wildlife Service
C - Candidate for listing as threatened or endangered
LE - Listed Endangered
LT - Listed Threatened
<C1 - Category 1 Candidate prior to 28 February 1996, currently no formal status, a species of concern
<C2 - Category 2 Candidate prior to 28 February 1996, currently no formal status, a species of concern

U.S. Department of Interior
H&B - Protected under Wild Free Roaming Horses and Burros Act
EA - Protected under Bald and Golden Eagle Act

Bureau of Land Management
N - Nevada Sensitive Species designated by Nevada State Office for inclusion as Special Status Species

Forest Service
FS - Humboldt-Toiyabe National Forest Sensitive Species

State of Nevada
CE - Critically Endangered regulated under NRS 527.260-.300)
CE# - Recommended Critically Endangered under NRS 527.260-.300, pending formal listing
CY - Cactus, yucca, or Christmas tree regulated under NRS 527.060-.120
NPT - Protected Threatened species regulated under NAC 503.001-.090
NPE - Protected Endangered species regulated under NAC 503.001-.090
G - Regulated as game under NAC 503.001-.090
F - Regulated as furbearer under NAC 503.001-.090
P - Protected birds regulated under NAC 503.001-.090

[b]Does not include all bird species that may occur at the study area which are protected by the Migratory Bird Treaty Act or by Nevada Administrative Code 503.050. Additionally, there are 26 birds which have been observed on the NTS, which are all protected by the State.

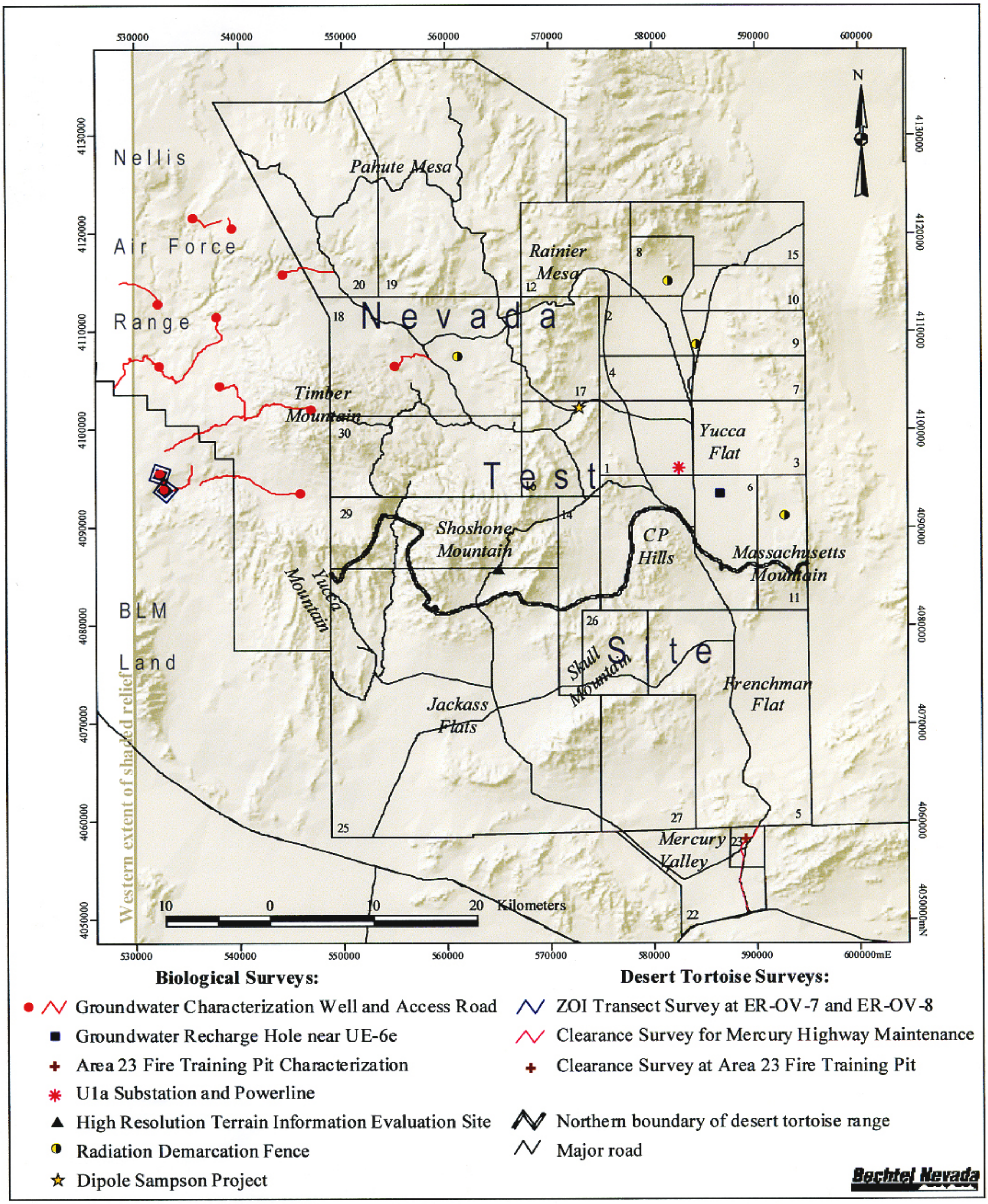


**Figure 1. Biological and desert tortoise surveys conducted on and off the Nevada Test Site in FY98**

**Table 2. Summary of biological surveys conducted for seven programs during FY 1998**

| Project | Sponsor[1] | Important Species/ Resources Found | Area Surveyed (ha) | Conservation Recommendations |
|---|---|---|---|---|
| Twelve Groundwater Characterization Wells | ER/UGTA | Predator burrows, Joshua trees, raptor or raven nests, cacti | 348.5 | Avoid resources during construction; flag and fence sump to deter wildlife usage; monitor wildlife usage |
| Groundwater Recharge Hole near UE-6e | ER/UGTA | None | 0.01 | None |
| High Resolution Terrain Information Evaluation Site | NIMA | None | 1,500 | Minimize off-road driving |
| Area 23 Fire Training Pit Characterization | ER | None | 1.74 | None |
| U1a Substation and Powerline | DP/JTO | Joshua trees, predator burrows | 9.4 | Avoid flagged resources |
| Radiation Stay-Out Fences | DP/RD | Predator burrow | 9.8 | Avoid flagged resources |
| Dipole Sampson | DTRA | Joshua trees, cacti, horse sign | 16.8 | Avoid Joshua trees during construction |
| Total | | | 1,886.25 | |

[1]Sponsors:
ER/UGTA - Environmental Restoration/Underground Test Area program
NIMA - National Imagery and Mapping Agency
DP/JTO - Defense Program/ Joint Test Office
DP/RD - Defense Program/Radiation Demarcation program
DTRA - Defense Threat Reduction Agency

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# 3.0 DESERT TORTOISE COMPLIANCE

## 3.1 Task Description

The threatened desert tortoise occurs within the southern one-third of the NTS and could be affected by DOE/NV operations. To comply with the Endangered Species Act (ESA), DOE/NV reinitiated formal consultation with the U.S. Fish and Wildlife Service (FWS) in December 1995 on programmatic activities at the NTS over the next ten years. In August 1996, FWS issued a Biological Opinion (Opinion) to DOE/NV (FWS, 1996) which allows incidental take of the desert tortoise on the NTS if the terms and conditions of the Opinion are followed to minimize impacts on the species.

The Desert Tortoise Compliance task of EMAC was developed to implement the terms and conditions of the FWS Opinion, to document compliance actions taken by DOE/NV, and to assist DOE/NV in FWS consultations. The terms and conditions that were conducted for DOE/NV by BN staff biologists in FY 1998 included: (1) conducting clearance surveys at project sites within 24 hours from the start of project construction, (2) conducting zone-of-influence (ZOI) transect surveys to determine presence/absence of tortoises within poor habitat or habitat along the boundary of the species' range, (3) ensuring that environmental monitors are on site during heavy equipment operation, (4) ensuring that required tortoise-proof fencing is maintained around open excavations and water impoundments, and (5) preparation of an annual compliance report for submittal to FWS.

## 3.2 Task Progress Summary

### 3.2.1 Project Surveys and Compliance Documentation

Biologists conducted desert tortoise clearance surveys at two proposed NTS project sites: the Mercury Highway Road Grading site in Area 5 and the Area 23 Fire Training Pit Characterization site in Area 23 (Figure 1). No tortoises or sign of tortoises were found during these surveys. Remediation activities occurred at Buildings 3101, 3102, and 3152 in Area 25 but a determination was made that no clearance surveys were necessary at the building sites which were within disturbed, unvegetated land.

Tortoise clearance and ZOI transect surveys were conducted near Beatty, Nevada, at the proposed UGTA wells ER-OV-7 and ER-OV-8 (Figure 1) to determine if the wells were within the geographic range of the desert tortoise. A total of 10.6 ha (26.2 ac) within the project areas and 28.0 kilometers (km) (17.4 miles [mi]) of ZOI transects were surveyed for the UGTA wells, and no tortoises or definite tortoise sign were found.

BN ensured that on-site construction monitoring was conducted by the designated environmental monitor at the Mercury Highway Road Grading site, the Area 23 Fire Training Pit Characterization site, and the Area 25 remediation activity sites at Buildings 3101, 3102, and 3152.

To ensure the maintenance of required tortoise-proof fences, monitoring was conducted at the dry sump at ER-5-2 Well and at sewage treatment ponds in Areas 6 and 23. The frequency of fence monitoring was reduced from four times a year (quarterly) to once a year at the lagoons and twice a year at ER-5-2 Well. This change was based on data accumulated over the past two years and was approved by ESHD as a prudent measure to ensure compliance at reduced costs and effort. Fence monitoring letter reports were prepared and submitted to ESHD throughout the FY (BN, 1997b; 1998f; i; p).

The Desert Tortoise Protection brochure was distributed to 205 BN employees and DOE/NV contractors. The brochure is part of the Desert Tortoise Training Program for NTS workers required under the Opinion.

On January 7, 1997, BN submitted to ESHD the annual report that summarized tortoise compliance activities conducted on the NTS from January 1 through December 31, 1997 (BN, 1998a). This report, required under the Opinion, contains (1) the location and size of land disturbances that occurred within the range of the desert tortoise during the reporting period; (2) the number of desert tortoises injured, killed, or removed from project sites; (3) a map showing the location of all tortoises sighted on or near roads on the NTS; and (4) a summary of construction mitigation and monitoring efforts.

### 3.2.2 Publication of Updated Tortoise Distribution and Abundance Map

A report entitled *The Abundance of Desert Tortoises on the Nevada Test Site Within Ecological Landform Units* was finalized and distributed in September 1998 (Woodward, et al., 1998). This report summarizes the objectives, methods, and results of extensive field transect surveys completed in FY 1997. A total of 339 transects covering 902 km (559 mi) were sampled within 206 ecological landform units (ELUs) (see section 4.2.1). Relative tortoise abundance was computed for each ELU sampled and an update of the NTS tortoise abundance map was produced and is presented in the report. The map was submitted to the FWS in January 1998 as an update to the tortoise abundance map in the NTS Opinion. The map is used by BN and DOE/NV for siting projects in areas of lowest tortoise abundance, which are also areas where tortoise clearance surveys are optional.

### 3.2.3 Coordination with Desert Tortoise Conservation Biologists

On April 3-5, 1998, a BN biologist attended the Twenty-third Annual Meeting and Symposium of the Desert Tortoise Council in Tucson, Arizona. This symposium is designed to allow exchanges of current information among scientists working with desert tortoise conservation and biology. Over 50 presentations were given and included topics such as anthropogenic influences on desert tortoise populations and habitats, recovery plans and mitigation measures, tortoise nutrition and reproduction, and research on upper respiratory tract disease. A list of abstracts was provided to all participants, and proceedings should be published next year. Presentations were evaluated for the applicability of their field methods, data analysis methods, or study results to tortoise conservation on the NTS.

# 4.0 ECOSYSTEM MAPPING

## 4.1 Task Description

In FY 1996, efforts began to map the wildlife and plant habitat of the NTS. Selected biotic and abiotic habitat features are collected within field mapping units called ELUs. ELUs are landforms with visually similar vegetation, soils, slope, and hydrology. Boundaries of the ELUs are defined using aerial photographs, satellite imagery, and field confirmation. ELUs are considered to be the most feasible mapping unit by which sensitive plant and animal habitats on the NTS can be described.

By the end of FY 1997, the southern one-third of the NTS and most of the Yucca Flat watershed basin were mapped. Mapping the remainder of the NTS and preparing draft maps of NTS vegetation and selected animal species habitats based on ELU data were scheduled for completion during FY 1998. These Geographic Information System (GIS)-based map products will be used in the NTS Resource Management Plan (RMP) currently being written by DOE/NV. Habitat and species range maps will also be prepared for inclusion in BN's Ecosystem Geographic Information System (EGIS).

Completion of this task will allow the integrated presentation, archiving, and analysis of NTS species distribution and abundance data with other geospatial habitat data from the NTS. The GIS-based map products and database produced will facilitate ecosystem management of the NTS, preparation of future environmental assessments and impact statements, and siting of new NTS projects and facilities.

## 4.2 Task Progress Summary

### 4.2.1 ELU Identification and Field Sampling

From March through August, approximately 550 ELUs were defined and sampled. To define the ELUs, NTS grid maps (published 1:24,000 scale aerial photographs [DOE, 1994]) were printed and overlayed with clear-plastic sheets on which preliminary ELU boundaries were drawn. Satellite imagery (10-meter [-m] [32.8-foot {-ft}] panchromatic and 20-m [65.6-ft] multispectral resolution) called SPOT (Satellite Pour l'Observation de la Terre) was also used to define ELU boundaries. Field biologists then visited each ELU. Biologists confirmed the unit boundaries and sample locations, photographed the site vegetation, and described the vegetation and other physical and biological characteristics of the unit (Table 3). The majority of the ELUs sampled were located within the mountains and mesas of the northwestern portion of the NTS (Figure 2). A few dozen sites were also sampled that were not accessible during the previous years. Much of the field sampling was delayed about one month due to a much cooler and wetter-than-average spring (possibly attributed to El Niño) which delayed the phenological development of the vegetation. A total of 1,510 ELUs have been sampled on the NTS (540 in FY 1996, 420 in FY 1997, and 550 in FY 1998).

### 4.2.2 Production of GIS Coverages and Map Products and Data Analysis

The spatial boundaries of the ELUs, which were marked on the clear plastic overlays of the NTS grid maps and field-verified, were transferred to orthogonally correct 7.5-minute U.S. Geological Service (USGS) quadrangle maps and digitized into a GIS (ArcView 3.0a). Edgematching was performed to ensure accurate ELU-boundary transitions between USGS maps. A polygon coverage of the ELUs was then prepared. All field data collected FY 1998 and FY 1997 (approximately 980 records) were entered into a relational database (Microsoft Access™). Data entry forms, tables, and reports were created and used to facilitate data entry (Figure 3). These data were then linked to the ELU polygon coverage and will be

**Table 3. Habitat and vegetation parameters measured on ELUs on the Nevada Test Site during FY 1998**

| Parameter | Definition |
|---|---|
| Landform | Landform categories included: Basin Floor-Playa, Basin Floor-Alluvial Flat, Piedmont Slope-Fan Skirt, Piedmont Slope-Fan Piedmont, Piedmont Slope-Inset Fan, Piedmont Slope-Ballena, Piedmont Slope-Alluvial Fan, Mountain-Ridgetop, Mountain-Mesa, Mountain-Midslope, Mountain-Footslope, Mountain-Foothills, Mountain-Valley. |
| Aspect | Aspect of ELU measured in degrees from north (0-360), and converted to a ranked measurement based on the amount of solar insolation that a site would receive. |
| Elevation | Meters above sea level. |
| Soil Texture | The percentage of sand, silt, and clay estimated based on soil type. |
| Geology | Surficial geology obtained from USGS geologic quadrangle maps of the NTS. |
| Slope | Degrees, from 0 to 90°. |
| Desert Pavement | Desert pavement rock size, recorded as None, Fine (<5 cm), Medium (5-15 cm), or Coarse (>15 cm). |
| Desert Pavement Cover | Percentage of shrub interspace ground surface covered by desert pavement. |
| Cryptogams | The relative cover of cryptobiotic crust, recorded as None, Low, Medium, or High. |
| Production | The productivity of annual plants, recorded as Low, Medium, or High. |
| Rodent Abundance | The abundance of rodents, recorded as None, Poor, Fair, Abundant, or Very Abundant. |
| Horse Sign | The amount of horse sign (tracks, trails, scat) observed, recorded as None, Fair, Abundant. |
| Vegetative Cover | Percentage of ground covered by perennial plants. |
| Vegetation | Relative abundance, in percent, of shrub/tree species. |

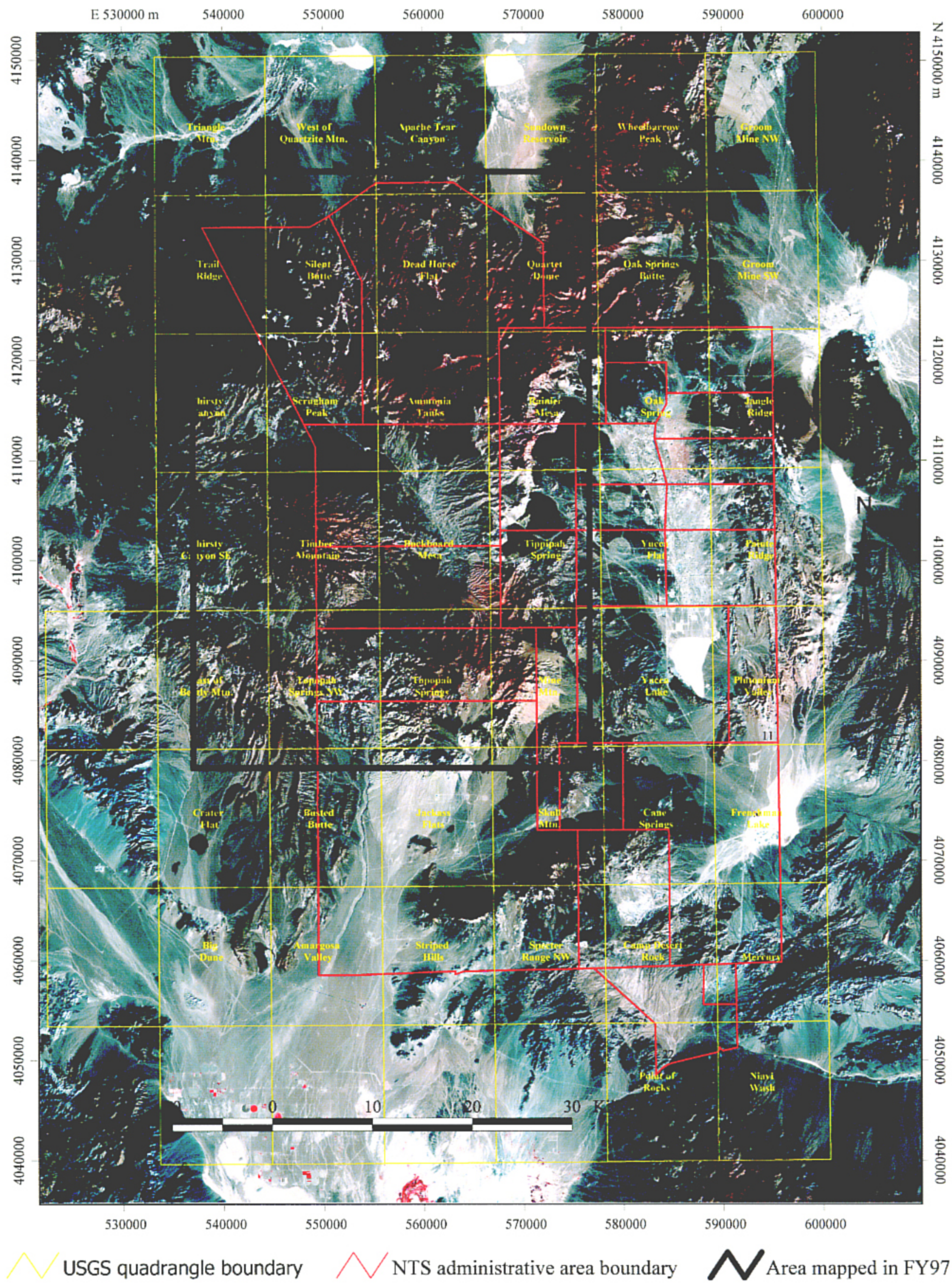


**Figure 2. Area in which ELUs were identified and sampled on the Nevada Test Site during ecosystem mapping in FY 1998**

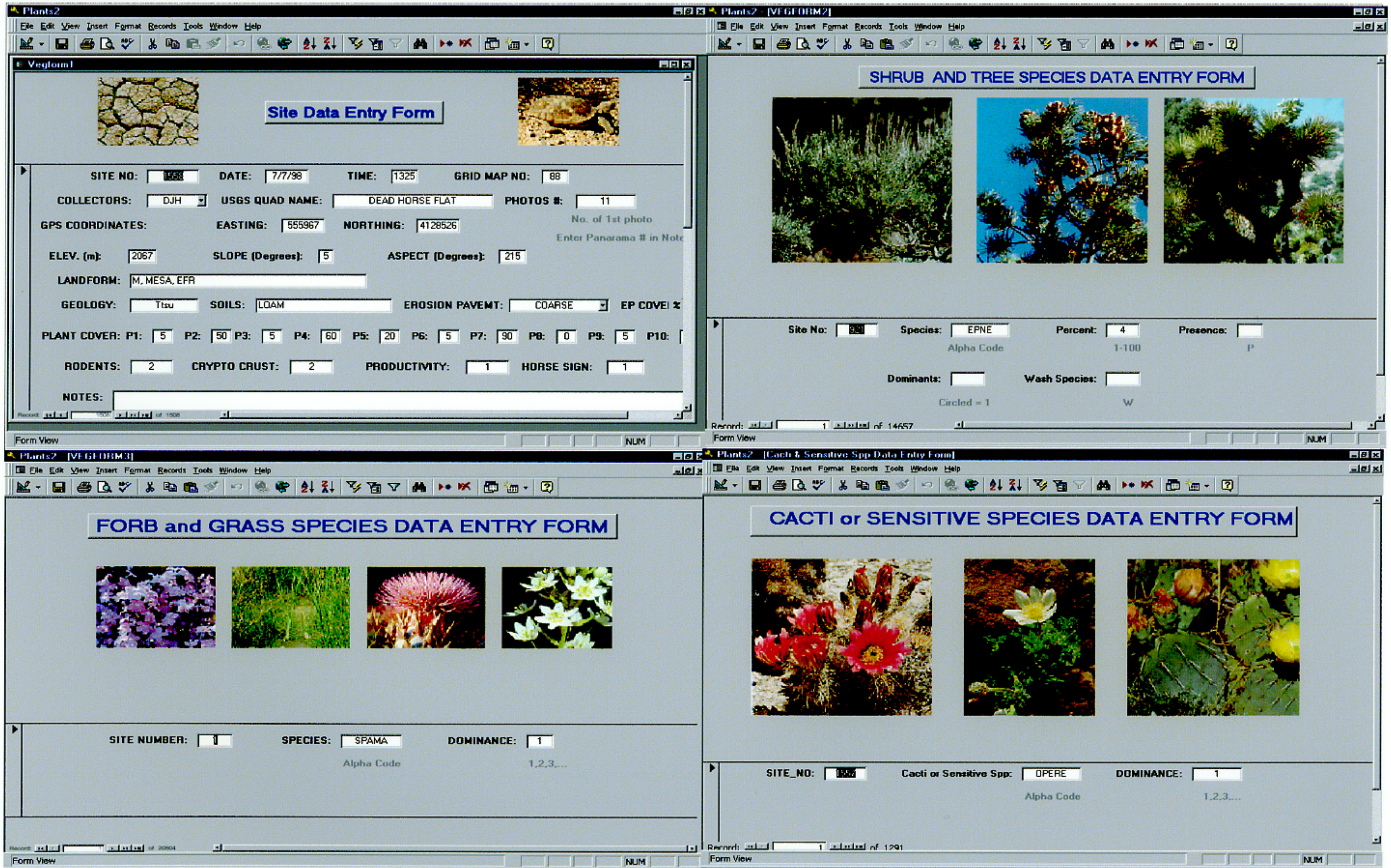


**Figure 3. Examples of data entry forms for ELU site data**

linked to other spatial data within BN's EGIS. These data are linked through common data fields within the several databases. Examples of databases which are, or will be, linked to ELUs include lists of animal species likely to inhabit an ELU based on its vegetation association and lists of University of Nevada, Las Vegas (UNLV) and NTS herbarium plant specimens that have been collected from habitat similar to that of a particular ELU.

Shrub/tree abundance within ELUs was analyzed statistically by cluster analyses (using average linkage and euclidean distance squared clustering methods) to establish groups of similar habitats/ELUs based on the abundance of shrub/tree species. Cluster groups were then named according to the two or three most-abundant shrub species found in the cluster groups. Individual ELUs were then color-coded to produce a draft vegetation map of the NTS based on the newly established plant communities determined by the cluster analyses. In September, the GIS coverage of these plant communities was submitted to BN Biotech Services/GIS Group for inclusion in the NTS RMP. Individual species distribution maps and other spatial relationships of biological and physical characteristics of NTS habitats based on the ELU polygon coverage will be developed during FY 1999.

### 4.2.3 Coordination with Ecosystem Management Agencies/Scientists

Two BN scientists participated in a workshop held April 25 to May 1, 1998, at Zzyzx, California, entitled New Research Directions in Desert Surficial Processes and Landscape Dynamics on Military Lands. The national workshop was sponsored by the Desert Research Institute and the U.S. Department of Defense. The workshop consisted of field tours, discussion groups, and formal presentations on topics of Mojave Desert soils and surface characteristics; ecosystem processes; erosion and deposition processes; and landscape dynamics, landscape evolution, and modeling. The information provided and professional contacts made at the workshop were pertinent to ecosystem mapping of the NTS which is based on the use of ecological landforms.

BN scientists presented the preliminary results of ecosystem mapping on the NTS at the Tenth Wildland Shrub Symposium at Snow College in Ephriam, Utah, on August 12-14, 1998. The symposium focused on the ecology of shrubland ecotones in the western United States. BN scientists presented the plant community classifications for the Great Basin and Mojave Desert types of the NTS and the descriptive data for biological and physical factors of plant communities related to the elevation and precipitation gradient that spans the NTS. BN scientists also presented the results of revegetation test-plot studies conducted on the NTS in support of the DOE/NV Environmental Restoration program. Valuable information about vegetation monitoring techniques, instrumentation, and plant restoration techniques were received from other presenters and attendees at the symposium.

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# 5.0 SENSITIVE SPECIES AND HABITAT MONITORING

## 5.1 ESA-Protected Species and Species of Concern

### 5.1.1 Task Description

There are 26 species which have been observed on the NTS that are considered sensitive because they are either listed as threatened or endangered under the ESA, are current candidates for such listing, or are former candidates for listing (Table 1; status codes LT, LE, C, <C1, or <C2 ). Sitewide surveys for some of these sensitive species have been conducted to determine their distribution and abundance on the NTS and to identify potential threats to these species and their habitat. Information from these surveys is used to determine if further protection is required or if the species can be removed from candidate status.

Those species for which sitewide surveys have been conducted in the past under the EMAC program include 12 former candidate plant species (Table 1) (Blomquist *et al.*, 1995) and eight former candidate animal species (Steen, *et al.*, 1997). The eight animal species include the chuckwalla (*Sauromalus obesus*); western burrowing owl (*Speotyto cunicularia*); and six species of bats: small-footed myotis (*Myotis ciliolabrum*), long-eared myotis (*M. evotis*), fringed myotis (*M. thysanodes*), long-legged myotis (*M. volans*), pale Townsend's big-eared bat (*Plecotus townsendii pallescens*), and the spotted bat (*Euderma maculatum*). The past sitewide surveys identified the location of plant populations and animal habitats which may be impacted by NTS activities.

Clokey's eggvetch (*Astragalus oophorus* var. *clokeyanus*) is currently a candidate plant known to occur on the NTS. The Blue Diamond cholla (*Opuntia whipplei* var. *multigeniculata*) is also a candidate plant that, prior to this year, was suspected of occurring on the NTS. Surveys to determine the occurrence and distribution of these two species on the NTS were initiated in FY 1996 and were scheduled for completion this fiscal year. A draft topical report and GIS-produced map describing known NTS distribution of Clokey's eggvetch was to be completed.

Also during FY 1998, ongoing field investigations for the burrowing owl and the six bat species listed above were planned. Although the distribution of burrowing owls on the NTS was defined over the past two years of field surveys (Steen *et al.*, 1997), it was unknown whether burrowing owls occurred year-round on the NTS. Also, a new technique to identify the presence or absence of bat species based on their vocalizations (versus trapping), was planned for field testing this FY. Field surveys using this new technique are planned for next FY to aid in identifying bat roost sites and to improve the quality of bat inventory data on the NTS.

Some of the federally protected species and species of concern listed in Table 1 have been sighted on the NTS, however no site-wide surveys to determine their distribution or abundance have been conducted in the past. They include the endangered American peregrine falcon (*Falco peregrinus anatum*), the threatened bald eagle (*Haliaeetus leucocephalus*), the candidate mountain plover (*Charadrius montanus*), and four former candidate bird species: the ferruginous hawk (*Buteo regalis*), least bittern (*Ixobrychus exillis hesperis*), loggerhead shrike (*Lanius ludovicianus*), and white-faced ibis (*Plegadis chihi*). All of these birds, with the exception of the loggerhead shrike, are uncommon transients to the NTS and are not expected to be impacted by NTS activities. Loggerhead shrikes have been observed on the NTS every month of the year and are known to breed on-site. Future surveys for this bird may be planned if state or federal agencies change its status. Records of all bird sightings that are made opportunistically by EMAC biologists and other NTS workers are maintained to provide some data on these species' occurrence on the NTS.

### 5.1.2 Task Progress Summary

#### 5.1.2.1 *Clokey's Eggvetch*

Prior to 1995, the distribution of Clokey's eggvetch was thought to be confined to the Spring Mountains west of Las Vegas, Nevada. Since that time, much has been learned about the distribution of this species. Beginning in 1995 and continuing through 1997, several new populations of Clokey's eggvetch were located in the Belted Range. The northern-most population in the Belted Range was found at Indian Springs located approximately 16 km (10 mi) north-northeast of the NTS boundary (Knight and Smith, 1996). In 1997, BN biologists found several populations of Clokey's eggvetch on the NTS in the southern extension of the Belted Range and in the Kawich Range (BN, 1997a). The Kawich Range population was a significant find because it is currently the northern-most known location of the species.

During the 1998 field season, two significant finds were made, one on Timber Mountain, an area targeted for surveys this spring, and one on Shoshone Mountain. Clokey's eggvetch was found at two locations on Timber Mountain, one on the north slope of the southern peak and the other in a draw on the south slope of the northern peak. Clokey's eggvetch was also found along the old Shoshone Trail on the north slope of Shoshone Mountain. This population was found while conducting ecosystem mapping (see Section 4.0). The Timber Mountain locations and the Shoshone Mountain location are significant in that they are well south of other collections of the species in the Belted Range and represent a more clearly defined bridge or link to the Spring Mountain populations of Clokey's eggvetch.

Most of the potential habitat of Clokey's eggvetch on the NTS has been surveyed and its presence or absence documented (BN, 1997a). A topical report of the results of the surveys over the past three years and a GIS-produced map of its NTS populations (Figure 4) was prepared during August and September and will be printed and distributed early in FY 1999 following DOE review. The survey work completed on this species has contributed significantly to the overall understanding of this species' distribution and need for protection. Although its distribution extends from the Spring Mountains north to Cedar Pass in the Kawich Range with numerous populations in between, its geographic distribution might still be considered restricted. Like other plant species on the NTS with limited distribution, Clokey's eggvetch should be considered a sensitive species, but at this time does not warrant protection under the ESA.

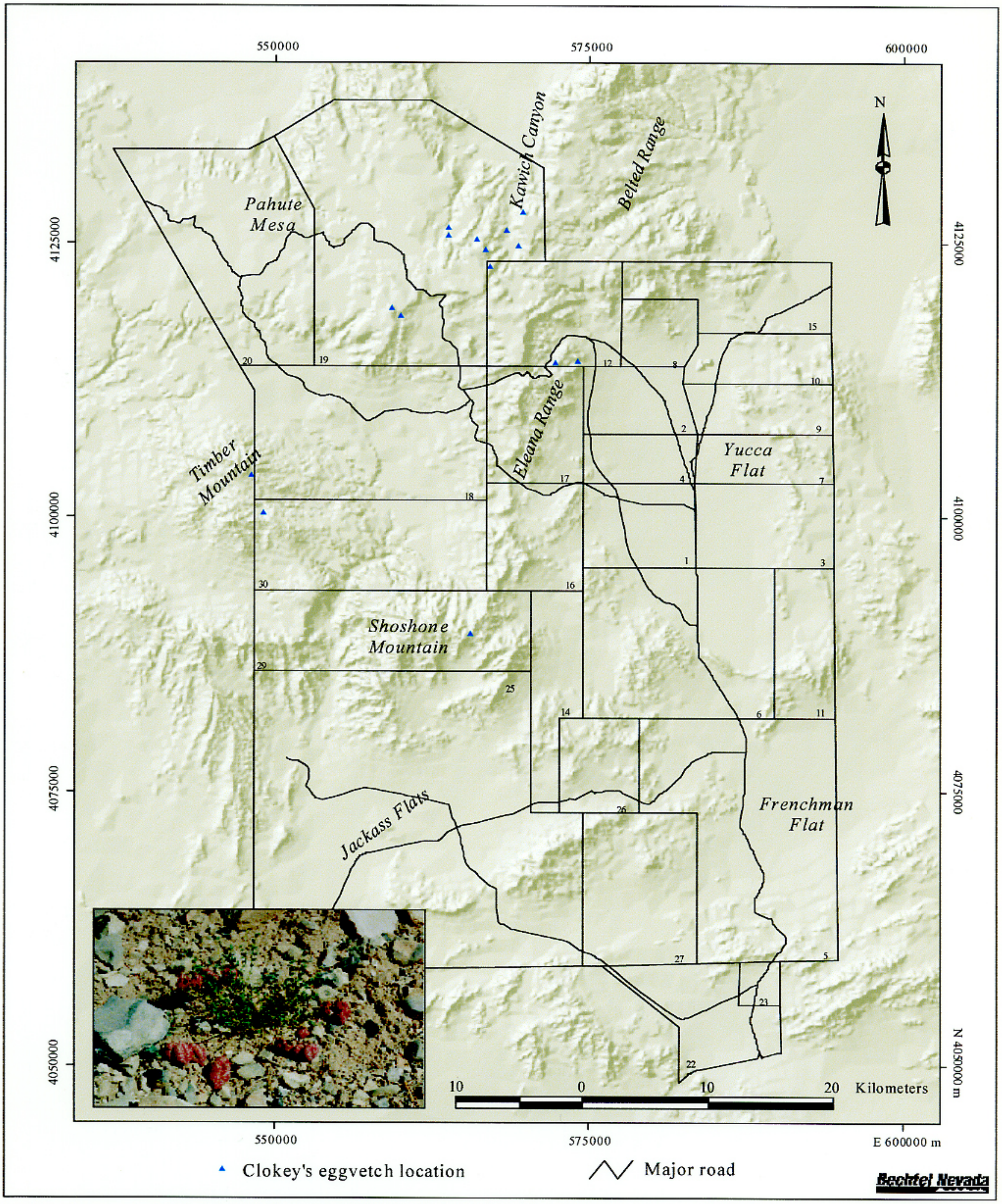



**Figure 4. Distribution of Clokey's eggvetch on and adjacent to the Nevada Test Site**

#### 5.1.2.2 *Blue Diamond Cholla*

A cholla found in the vicinity of Mercury was thought to possibly be the Blue Diamond cholla, a candidate plant species and a species known primarily from the southern and eastern portions of the Spring Mountains. The only specimen of cholla collected near Mercury in the NTS herbarium was identified as staghorn cholla (*Opuntia echinocarpa*). In FY 1996, the specimen was examined as possibly being the Blue Diamond cholla, but because there were no fruits with the specimen, positive identification was not possible. The specimen was later sent to Janet Bair of the FWS for identification, but again because the specimen did not have fruits, positive identification of the specimen was unlikely. In FY 1997, BN botanists examined several chollas near Mercury and found that the flowers did not fit the description of those of the Blue Diamond cholla. No fruits were produced that year, however, so comparison of fruit characteristics and positive species identification were again not possible.

This year the fruit set on the chollas near Mercury was good and fruits were collected and examined. The fruits do not fit the description of fruits of the Blue Diamond cholla. According to Benson (1977), Blue Diamond cholla fruits are "fleshy at maturity, strongly tuberculate, spineless, obovoid or subglobose, about ¾ to 1¼ inches long, ½ to ¾ inches or rarely ⅞ inch in diameter . . . seeds pale tan, about ⅛ inch long." In contrast, fruits of the staghorn cholla are described as "green but turning to light tan or straw color, with dense spreading spines on the upper half, obovoid-turbinate or nearly hemispheric, ¾ to 1 or 1¼ inches long, ½ to ¾ inch in diameter, seeds ¼ inch in diameter." Fruits collected from populations of cholla around Mercury this year are best described as fruits of staghorn cholla. Some of the fruits were still greenish and fleshy while many had dried and were a pale tan. Fruits were ⅞ to 1 inch long. The greener fruits were almost ⅞ inch wide but as the fruit dried, widths were more commonly ¾ inch. The seeds were ¼ inch long plus or minus 1/16 inch. Based on this information, the cholla found around Mercury is staghorn cholla and not Blue Diamond cholla. Blue Diamond cholla should therefore not be listed as a species of concern for the NTS (it is therefore not included in Table 1).

#### 5.1.2.3 *Coordination With Natural Resource Agency Botanists*

On April 2, 1998, a BN botanist attended the Northern Nevada Native Plant Society (NNNPS) Rare Plant Committee meeting. This meeting is held every other year and provides an opportunity for resource agencies to coordinate their efforts on rare plant species and make recommendations regarding species that may need protection under state or federal laws and regulations. Presentations were given by the FWS, BLM, U.S. Forest Service, Hawthorne Ammunition Depot, Nevada Division of Forestry, Nevada Natural Heritage Program, and the NNNPS. Approximately 25 species were discussed. Two of those, Clokey's eggvetch and an undescribed species of *Phacelia*, occur on the NTS. Due to the recent discoveries of new populations of Clokey's eggvetch on the NTS and on the NAFR Complex, the recommendation was made to remove this species from the candidate list under the Endangered Species Act. The *Phacelia* species was recommended for addition to the NNNPS sensitive species list. This species should be named and described later this year. If needed, surveys to identify the occurrence and distribution of this newly described *Phacelia* on the NTS will be scheduled for FY 1999.

### 5.1.2.4 *Western Burrowing Owl*

Road and burrow monitoring surveys were conducted on the NTS between November 1, 1997 and July 28, 1998, to determine if burrowing owls are present on the NTS throughout the year and to better understand their temporal distribution and breeding habits. Prior to these surveys, burrowing owls had been documented to occur on the NTS during the months of January through October with no sightings during November and December (Steen *et al.*, 1997). Additionally, searches for new burrowing owl burrows were conducted during the November - July survey period to better document burrowing owl distribution on the NTS.

**Road Surveys** - Road surveys entailed driving standardized routes in known burrowing owl habitat, stopping approximately every 2 km (1.2 mi), and visually searching for burrowing owls with binoculars. Road surveys were conducted on five dates: November 5, November 25, December 15, January 27, and March 4. A southern route was located in the Mojave Desert portion of the NTS, and a northern route was located throughout Yucca Flat in the Mojave/Great Basin Desert transition region (Transition Region) of the NTS (Figure 5).

Two burrowing owl sightings were recorded in Area 9 during road surveys on the northern route, one on November 25 (UTM 585688mE; 4111108mN) around dusk, and one on December 15 (UTM 585916mE; 4108514mN) one hour before dusk. Based on these observations, burrowing owls have now been documented on the NTS during all months of the year. No burrowing owls were seen during road surveys on the southern route.

**Burrow Monitoring** - Burrow monitoring surveys entailed locating burrowing owl burrows, clearing all sign (i.e., pellets, scat, feathers, prey remains, etc.) from the burrow apron by hand, and checking each burrow periodically for burrowing owls or new burrowing owl signs. When new burrowing owl sign was found, it was documented and then cleared away. Between November 1 and March 31, the majority of known burrows in the Mojave Desert region and the Transition Region of the NTS were visited twice a month. After April 1, known burrows were visited less frequently (Table 4).

By the end of July, a total of 35 burrowing owl burrows had been located and monitored, including 19 new burrows (Figure 5). Burrowing owls were sighted at three new burrow sites within the Great Basin Desert region of the NTS in the sagebrush (*Artemisia* spp.) vegetation type in Area 18 near Buckboard Mesa. This was the first documented sighting of burrowing owls in the Great Basin Desert portion of the NTS, and thus expands the known burrowing owl distribution on the NTS.

Burrowing owls or their fresh sign were found at 26 of the 35 burrows monitored. An owl or owl sign at a burrow was observed at least once on the NTS during each sampling period (Table 4). These data are consistent with data from the road surveys, and indicate that burrowing owls are found on the NTS throughout the year. The data also suggest that burrowing owl abundance on the NTS is highest during spring, summer, and fall (mid-March to November) and lowest during winter (December to mid-March). Also, the few owls present on the NTS during the winter may not be uniformly distributed throughout the three regions of the NTS. This winter, owl sign was only observed at burrows in the Transition Region. The data indicate that a significant influx of burrowing owls onto the NTS occurred during the middle of March, as shown by the sharp

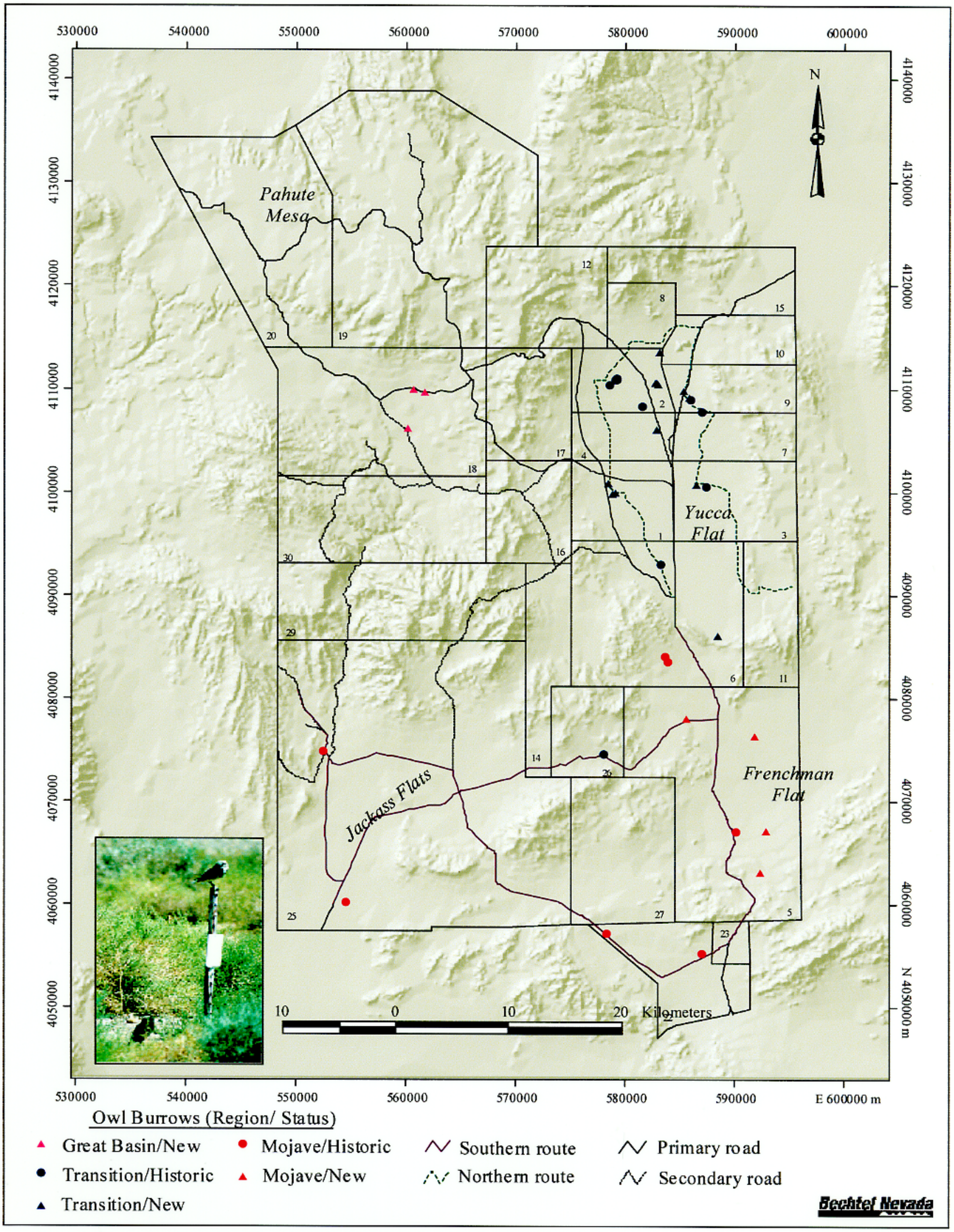



**Figure 5. Road survey routes and burrows monitored for burrowing owls in FY 1998**

increase in the percentage of burrows in the Transition Region that had fresh owl sign (Table 4). However, exact dates of arrival and departure of migrating owls most likely vary from year to year. The past winter and spring were unusually wet and cold. Monitoring surveys should be continued over several years (including warmer, drier years) to best document those months when burrowing owls are most and least abundant on the NTS.

No young burrowing owls were observed at the burrows monitored from April through July. Burrow monitoring should continue in subsequent years to document those months when owls breed on the NTS and when it is therefore more critical to ensure that owl burrows are protected from land-disturbing activities.

**Table 4. Summary of burrow use by burrowing owls on the Nevada Test Site during FY 1998**

| | Burrow Use* | | | | | |
|---|---|---|---|---|---|---|
| **Sampling Period** | **Mojave Desert** | | **Transition Region** | | **Great Basin Desert** | |
| November 1-15 | 2/5 | (40) | 3/8 | (38) | NKB | |
| November 16-30 | 2/7 | (29) | 3/8 | (38) | NKB | |
| December 1-15 | 1/8 | (13) | 2/11 | (18) | NKB | |
| December 16-31 | 0/10 | (0) | 2/14 | (14) | NKB | |
| January 1-15 | 0/10 | (0) | 1/16 | (6) | NKB | |
| January 16-31 | 0/10 | (0) | 2/16 | (13) | NKB | |
| February 1-15 | 0/10 | (0) | 3/18 | (17) | NKB | |
| February 16-27 | 1/10 | (10) | 2/18 | (11) | NKB | |
| March 1-15 | 1/3 | (33) | 2/18 | (11) | NKB | |
| March 16-31 | 2/10 | (20) | 13/20 | (65) | 1/1 | (100) |
| April 1-15 | NBS | | 3/4 | (75) | 1/1 | (100) |
| April 16-30 | 2/7 | (29) | 10/19 | (53) | NBS | |
| May 1-31 | 1/3 | (33) | 6/10 | (60) | 1/2 | (50) |
| June 1 - July 28 | 1/3 | (33) | 4/11 | (36) | 1/3 | (33) |
| **Total Burrows** | **10** | | **22** | | **3** | |

*Numerator - Number of burrows where sign was found.
Denominator - Number of burrows sampled.
( ) - Percent of sampled burrows where sign was found.
NBS - No burrows sampled.
NKB - No known burrows to sample.

### 5.1.2.5 *Bat Species of Concern*

Mist-net traps have been used on the NTS at selected natural and man-made water sources to document the presence of over 11 bat species, of which 6 are either species of concern or state-protected (Steen *et al.*, 1997). It is not known, however, if these species roost on the NTS and are, therefore, subject to impacts from DOE activities. Field surveys are needed to identify bat roost sites on the NTS and to identify which species of bats utilize them. Because it is difficult and labor intensive to set up and run mist-net traps, and it is difficult to capture some bat species increase in the percentage of burrows in the Transition Region that had fresh owl sign (Table 4). in mist nets, an electronic acoustic device for detecting the presence of specific bat species was purchased and field-tested this year. Such devices, called bat detectors, allow researchers to hear or see the ultrasonic echolocation calls of bats which are species-specific. The portable field device purchased was the Anabat II (Titley Electronics, Ballina, Australia). The Anabat II records the ultrasonic calls emitted by bats and saves them to the hard drive of a laptop computer. These vocalizations are displayed and analyzed by the Anabat II software, and species determinations are made based on the minimum frequency, frequency range, slope and overall pattern of each call sequence.

The goals of this year's field surveys were to (1) confirm the presence or absence of the small-footed myotis (*Myotis ciliolabrum*), a sensitive species, on the NTS, (2) obtain the vocal signatures of as many bat species as possible, (3) compare Anabat II call data with mist-net capture results, and (4) conduct a preliminary road survey for bats using the Anabat II.

It has been difficult to determine the difference between the small-footed myotis and the California myotis (*M. californicus*) in the field. Although suspected to occur, the small-footed myotis has not been positively identified on the NTS (Steen *et al.*, 1997). However, recent morphometric work by bat researchers and the development of the Anabat II have allowed positive field identification of these two species. Constantine (1998) describes a 1.5- to 2.5-millimeter extension of the tail beyond the interfemoral membrane on the small-footed myotis that is absent in the California myotis, and O'Farrell (1997) found that these two species differ in the minimum frequencies of their calls, which are around 40 kilohertz (kHz) in the small-footed myotis and 50 kHz in the California myotis.

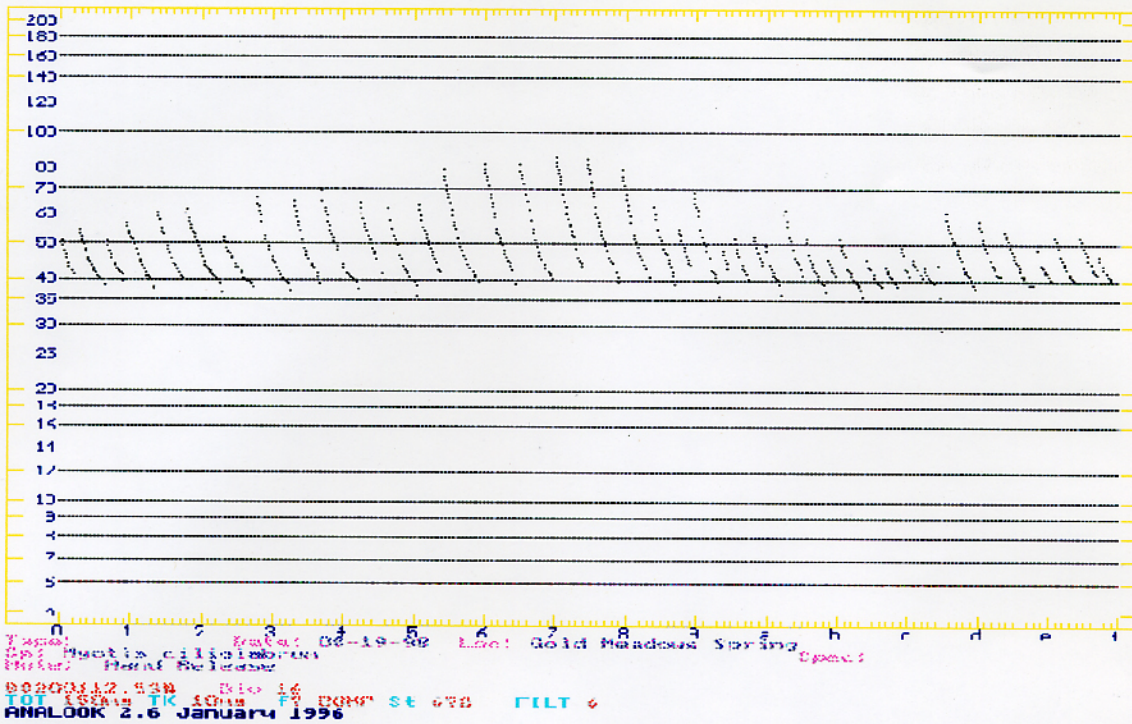
Field surveys were conducted from July through August. BN biologists mist-netted bats for one night at one or two water sources within each of the three major desert vegetation regions of the NTS: the Mojave, Transition, and Great Basin. These water sources included Camp 17 Pond (July 27), Gold Meadows Spring (August 19), Yucca Playa Pond (August 24), and J-11 Pond (August 25). Mist-net surveys were conducted from approximately 8 p.m. to 5:30 a.m. at all sites but Yucca Playa Pond. Mist-netting was suspended at 11 p.m. at this site because no bats had been caught to this point, and there were very few bat calls being recorded by the Anabat II.

Anabat surveys were conducted in conjunction with the mist netting at Gold Meadows Spring, Yucca Playa Pond, and J-11 Pond. They were conducted to obtain voucher calls from hand-released, known bat species and to compare call data with mist-net data. Additionally, an Anabat road survey was conducted throughout the southern third of the NTS on August 18. The road survey entailed driving a vehicle along Jackass Flats Road, Lathrop Wells Road, Cane Spring Road, and Mercury Highway at approximately 16-32 kilometers per hour (10-20 miles per hour) with the Anabat II detector held out the window. During the road survey, stops were made near the Mercury Sewage Ponds (Area 23), at J-11 Pond (Area 25), and at Nuwax Pond (Area 25). The survey started at dusk and continued until 1:30 a.m.

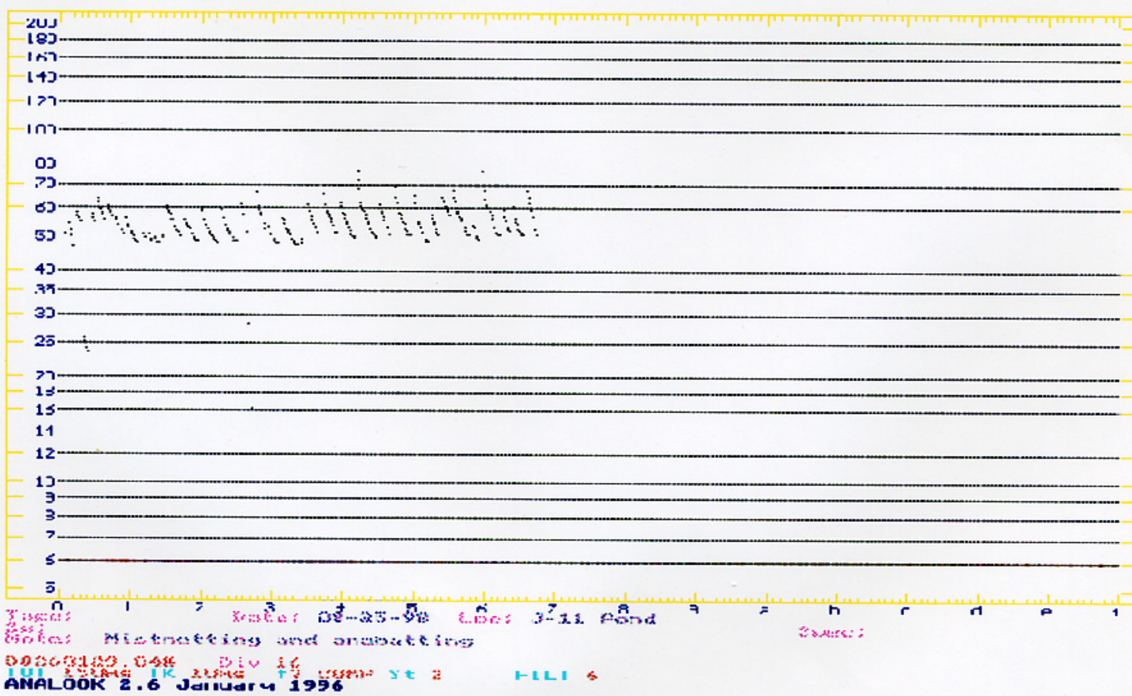
**Positive Identification of Small-footed Myotis on the NTS** - Results from the mist-netting are found in Table 5. Forty bats representing two species of concern were captured; namely, the small-footed myotis and the long-eared myotis (*M. evotis*). Both species were caught only in the Great Basin region of the NTS. For the first time, BN biologists verified the occurrence of the small-footed myotis on the NTS using both their tail extension measurements and their recorded calls. At Gold Meadows Spring, BN biologists were able to examine, hand-release, and record the calls of 15 of the 26 small-footed myotis captured in mist nets. BN biologists similarly examined and recorded the calls of one of the four California myotis captured at J-11 Pond. All of the 15 small-footed myotis had the 1.5 - 2.5 millimeters tail extension, while the one California myotis did not. All the recorded calls of the 15 small-footed myotis had a minimum frequency around 40 kHz and the calls of the one California myotis had a minimum frequency around 50 kHz (Figure 6). Captured bats whose calls were not recorded were identified based on the presence or absence of the tail extension.

**Table 5. Number of bats captured by location during FY 1998 in three regions of the Nevada Test Site**

| | Great Basin Desert | | Transition Region | Mojave Desert | |
|---|---|---|---|---|---|
| **Species Captured** | **Camp 17 Pond** | **Gold Meadows Spring** | **Yucca Playa Pond** | **J-11 Pond** | **Total** |
| **Species of Concern** | | | | | |
| *Myotis ciliolabrum*<br>Small-footed myotis | 11 | 26 | 0 | 0 | 37 |
| *Myotis evotis*<br>Long-eared myotis | 0 | 3 | 0 | 0 | 3 |
| **Other Species** | | | | | |
| *Antrozous pallidus*<br>Pallid bat | 4 | 2 | 0 | 10 | 16 |
| *Eptesicus fuscus*<br>Big brown bat | 2 | 8 | 0 | 0 | 10 |
| *Myotis californicus*<br>California myotis | 1 | 0 | 0 | 4 | 5 |
| *Pipistrellus hesperus*<br>Western pipistrelle | 2 | 0 | 0 | 39 | 41 |
| *Tadarida brasiliensis*<br>Mexican free-tailed bat | 1 | 0 | 0 | 1 | 2 |
| **Total** | **21** | **39** | **0** | **54** | **114** |




Small-footed myotis (Myotis ciliolabrum)




California myotis (Myotis californicus)

**Figure 6. Vocalizations of the small-footed myotis and California myotis**

**Recorded Bat Calls** - Individuals of known species captured in mist nets were hand released and their calls recorded at Gold Meadows Spring and J-11 Pond. At Gold Meadows Spring, calls were recorded for four species; namely, the big brown bat (*Eptesicus fuscus*), the pallid bat (*Antrozous pallidus*), the long-eared myotis (*Myotis evotis*), and the small-footed myotis. At J-11 Pond, calls of three species were recorded. These included the pallid bat, California myotis, and Mexican free-tailed bat (*Tadarida brasiliensis*). These calls have been archived as data files and will be used to classify new calls collected with the Anabat II. More mist-netting is needed to obtain recorded voucher calls of all species known to occur on the NTS.

**Comparison of Capture and Call Data** - The preliminary capture and call data gathered this year were examined to determine which technique is best at detecting the presence of bats. The hypothesis is that the Anabat II will detect more species which are present in an area than will mist netting because mist nets can be successfully avoided by bats. This has been demonstrated by BN biologists who have observed, with the aid of night vision equipment on numerous occasions, bats flying around mist nets without getting caught. This year at Yucca Playa Pond, no bats were captured in the mist nets, but a total of 45 calls, including at least 3 unique calls, were recorded on the Anabat II. Analysis of the call data collected at Gold Meadows Spring and J-11 Pond has not been completed.

**Road Survey Inventory Using Anabat II** - Bat calls were recorded continuously along the road survey route, with the highest activity near water sources. The analysis of the recorded calls has not been completed to identify all species or to quantify bat activity along various portions of the route. A preliminary analysis, however, indicates that the western pipistrelle (*Pipistrellus hesperus*) was the most active bat species along the survey route. The western pipistrelle was also the most active at Yucca Playa Pond and J-11 Pond, while the small-footed myotis was the most active species at Gold Meadows Spring.

**Continued Monitoring Using Anabat II** - Continued monitoring is needed to identify the distribution of sensitive bat species and their roost sites on the NTS. The Anabat II system appears to be a very cost-effective way of monitoring bats on the NTS. Anabat surveys (which require only one biologist) could replace mist-netting surveys (which require at least three biologists) and, therefore, substantially reduce the costs of conducting bat inventories on the NTS. In FY 1999, Anabat road surveys will be conducted in other regions (i.e., Great Basin and Transition) of the NTS. Searches for potential roost sites will also be conducted and the Anabat II will be used to determine bat activity by species at all potential roost sites found.

**Coordination With Wildlife Conservation/Management Biologists** - A BN biologist attended the Western Bat Working Group Workshop in Reno, Nevada, on February 9-13. The workshop focused on the ecology, conservation, and management of western bat species. On May 19-20, a BN biologist attended an Anabat workshop in Fort Collins, Colorado. The workshop taught techniques for the effective use of Anabat II in identifying free-flying bat species. The information provided and the professional contacts made at both of these workshops have been and continue to be extremely helpful in the design and implementation of the monitoring program for sensitive bat species on the NTS. Additionally, upon request, bat data collected during 1996 was sent to the Nevada Natural Heritage Program.

## 5.2 Other Federally Protected/State-Managed Species

### 5.2.1 Task Description

Wild horses (*Equus caballus*) occur on the NTS and ongoing monitoring tasks were scheduled in FY 1998 for this species. The Wild Free-Roaming Horse and Burro Act of 1971 calls for the management and protection of wild horses and burros on public lands in a manner that is designed to achieve and maintain a thriving natural ecological balance. Although the NTS is on land withdrawn from public use, DOE/NV entered a Five-Party Cooperative Agreement in 1976 with the Nellis Air Force Base (Nellis), the Nevada State Department of Fish and Game (currently the Nevada Division of Wildlife [NDOW]), the FWS, and the BLM to maintain favorable habitat on federally withdrawn lands for wild horses and burros and other species of wildlife. The agreement called for cooperation in conducting resource inventories and developing resource management plans for these animals based on inventory data. (A new agreement between DOE, Nellis, FWS, BLM, and the State of Nevada Clearinghouse was signed in 1997 with the similar goal to enhance management of the natural resources within ecosystems on NAFR, NTS, and the Desert National Wildlife Range.) Nellis allows BLM to conduct periodic horse roundups and removals on the NAFR to ensure sustainable populations of wild horses and wildlife forage species on the range, and DOE/NV conducts an annual horse census on the NTS. The NTS horse population has not increased in size over time as on the NAFR, and it appears to be isolated from the NAFR population. In the past four years, a decline in horse numbers on the NTS has been observed. The NTS horse population appears dependent in the summer on several natural and man-made water sources in Areas 2, 12, and 18.

In FY 1998, BN biologists performed three subtasks related to horse monitoring.

- Annual horse abundance was estimated to monitor population stability.
- Horse sign (tracks or scat) were recorded in ELUs whenever they were observed to better define the geographic range of horses on the NTS.
- Selected natural and man-made water sources were visited in the summer to determine their influence on horse distribution and movements and to determine the impact horses are having on NTS wetlands.

Several birds of prey (raptors) occur and breed on the NTS which are not protected under the ESA and are not species of concern. Raptors, however, are protected by the federal government under the Migratory Bird Treaty Act and by the state of Nevada. Raptors include all vultures, hawks, kites, eagles, ospreys, falcons, and owls. Because these birds occupy high trophic levels of the food chain, they are regarded as sensitive indicators of ecosystem stability and health. Information on the number and distribution of raptor breeding sites on the NTS is lacking. Field studies were initiated this FY to identify such sites to better protect them from impacts of NTS activities.

The chukar (*Alectoris chukar*) is a state-managed game bird which breeds on the NTS. In past years, NDOW has removed some chukar from the NTS to transplant them to areas in Nevada open to hunting. DOE/NV allows NDOW to capture these birds for relocation when populations are high enough to support the relocation program. ESHD requests an annual chukar census to determine if capture and relocation is feasible year to year. In FY 1998, NDOW did not request permission to remove chukar from the NTS. Therefore, no census was performed and only opportunistic sightings of chukar are presented in this report.

### 5.2.2 Task Progress Summary

#### 5.2.2.1 *Wild Horses*

**Annual Horse Abundance Survey** - A mark-recapture survey technique was used in FY 1998 to estimate horse abundance on the NTS. The survey was conducted over non-consecutive days between March and July. A standard road course on the NTS was driven to locate and identify horses (Figure 7). Individuals were not marked, but were identified by their unique physical features. Individual horses observed more than one time during the sampling period were considered recaptures. All observations were used to compute a population size estimate using the computer program CAPTURE (White *et al.*, 1982). The population estimate based on the survey was 33 individuals and took 4 days of sampling. The 95 percent confidence interval for this population estimate was 33 to 36 animals. Four adult males observed in FY 1997 were not observed this year. Since 1995, the feral horse population, as estimated with the mark-recapture survey technique, has declined 36 percent, from 52 to 33 individuals. A cumulative total of 9 adult (> 1 year old) males and 12 adult females have been classified as missing since 1995, based on annual absolute count data.

Additional field surveys for horses were conducted between March 19 and September 9 to collect information on reproductive success. A total of eight foals were observed with their mothers and an additional three mares appeared to be pregnant. However by September 9, four of the previously observed foals were missing.

Natural processes (e.g., predation, emigration) are the likely causes of the observed population decline, but data to verify this have not been collected.

**Horse Usage of NTS Water Sources** - Two newly found wetlands in Area 30, called Wild Horse and Little Wild Horse springs (see section 5.3.2.1), are located within the annual horse range and were used by horses in spring and summer (Figure 7). Only two other natural water sources (Captain Jack Spring in Area 12, Gold Meadows Spring in Area 19) and one man-made pond (Camp 17 Pond in Area 18) were used by horses this summer, as in past years. Captain Jack Spring, Gold Meadows Spring, and Camp 17 Pond were used the most based on the presence and quantity of horse signs and trampled and grazed vegetation.

There are eight man-made water sources within or on the edge of the annual horse range that were not used by horses. These include the Well 2 Pond, Mudplant Pond, E Tunnel Containment Ponds, Area 12 Sewage Ponds, and plastic-lined sumps at ER 19-1, ER 12-1, U10j, and U2gg (see Section 5.3.2.2; Figure 14). Well 2 Pond was heavily used by horses in FY 1995, but has been dry since then. The Mud Plant Pond was used in FY 1996, but its water level has dropped since then, making the remaining water unreachable within this steep-sided, concrete-lined pond. No horse signs have ever been found at the E-Tunnel Containment Ponds or the Area 12 Sewage Ponds. Horse scat was found this year and in past years near the four plastic-lined sump locations, although horse tracks into the sumps and to the water's edge have never been observed.

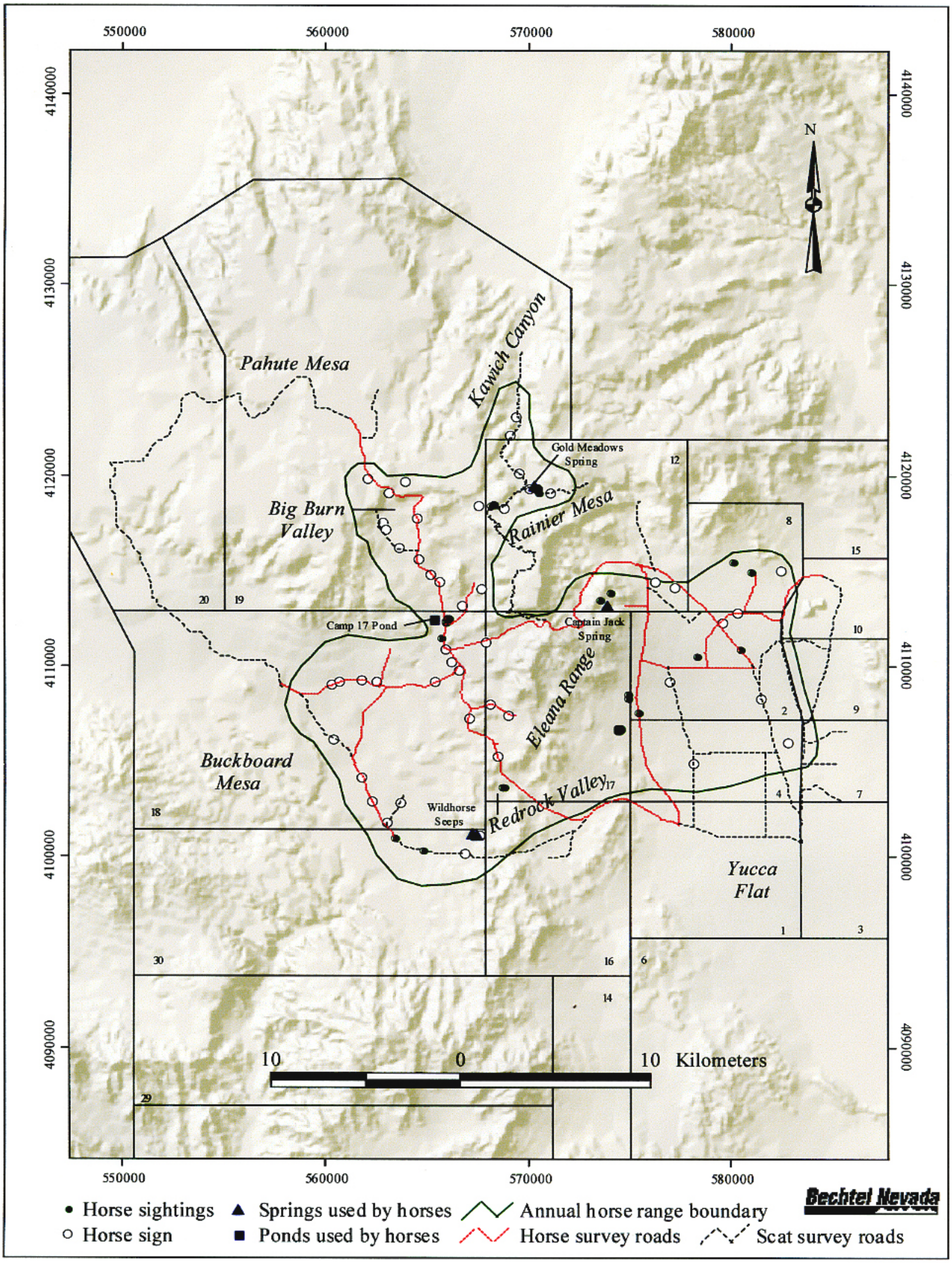



**Figure 7. Feral horse sightings and horse sign observed on the Nevada Test Site during FY 1998**

**Annual NTS Horse Range** - The annual population census of horses has routinely been conducted in the summer when horses are nearer to water sources and thus easier to find. These census surveys provide an adequate estimate of the summer range of horses on the NTS but are not useful for estimating their annual range. Therefore, efforts continued this year to record horse signs and horse sightings within ELUs to better estimate their annual range. Horse signs (e.g., scat, tracks) were recorded in each ELU sampled as part of the ecosystem mapping task and during surveys for sensitive plant species. All horse sign data collected this year were entered into the EGIS database. Next year, the data will be analyzed to characterize those vegetation communities used by horses and to map their distribution range.

Selected roads were also driven within and along the boundaries of the suspected annual horse range (Figure 7) and all fresh signs (estimated to be < 1 year old) adjacent to the roads were recorded. Five days of effort were expended for the road surveys. Horse sign data collected during the road survey and while monitoring wildlife use at natural and man-made water sources (see Section 5.3) indicate that the 1998 NTS horse range includes Kawich Canyon, Gold Meadows, northwest Yucca Flat, southwest foothills of the Eleana Range, the Eleana Range, Redrock Valley, Big Burn Valley, and southeast Pahute Mesa (Figure 7). The annual horse range appears not to have changed in areal extent or shape from the previous year.

### 5.2.2.2 *Raptors*

Including the burrowing owl (see Section 5.1.2.5), there are eight raptors (Table 6) which are known to breed on the NTS (Greger and Romney, 1994). Few records exist, however, of breeding raptors on the NTS or of their reproductive success, egg incubation periods, and fledging times (time when young leave the nest) (Hayward et al., 1963). Systematic surveys to locate raptor nests have never been conducted on the NTS. This spring, a combination of ground searches on foot, road surveys with vehicles, and aerial helicopter surveys were conducted.

**Table 6. Raptor species that occur and breed on the Nevada Test Site**

| Raptor Species | Common Name |
|---|---|
| *Aquila chrysaetos* | Golden eagle |
| *Asio otus* | Long-eared owl |
| *Buteo jamaicensis* | Red-tailed hawk |
| *Buteo swainsoni* | Swainson's hawk |
| *Falco mexicanus* | Prairie falcon |
| *Falco sparverius* | American kestrel |
| *Speotyto cunicularia* | Western burrowing owl |
| *Tyto alba* | Barn owl |

From April through July, ground searches and road surveys were conducted in two habitat types where nest substrates for raptors are available: Joshua tree habitats and cliff habitats (Figure 8). Some raptors are known to occupy old or inactive nests of other species; therefore, all previously known raven nests in these habitats were also visited and examined for raptor breeding activity. Binoculars and spotting scopes were used to search cliff faces and Joshua trees. Soaring raptors were also observed to determine if they were guarding or flying to and from a nest site. Areas around springs were also searched for raptor nests during monitoring of water sources (see Section 5.3). When nests were found, efforts were made to determine the number of young in the nest without disturbing the birds. All nest locations and nestling data were recorded and mapped. Nests containing young were periodically revisited to determine when the young fledged. The regions surveyed on ground and by vehicle included Frenchman Flat, Yucca Flat, Oak Spring Butte, Eleana Range, Buckboard Mesa, Falcon Canyon, Rainier Mesa, and Shoshone Mountain.

One helicopter survey was conducted on April 30 with the support of flight operations at the BN Remote Sensing Laboratory. This survey covered Skull Mountain and two hills in western Frenchman Flat (Hampel Hill and Mt. Salyer). From the helicopter, two biologists looked for stick nests on cliff faces.

Biologists found 12 active nests of 6 raptor species during the ground and vehicle surveys (Table 7, Figure 9). The six species found nesting include the American kestrel, barn owl, golden eagle, prairie falcon, red-tailed hawk, and Swainson's hawk. The most commonly found nests were cliff nests and Joshua tree nests of the red-tailed hawk (Figure 10). The Swainson's hawk also used a Joshua tree as a nest site, while the golden eagle and prairie falcon nests (Figure 10) were both found on cliffs. The numbers of nestlings detected varied from one to seven. Most nestlings fledged during June. Swainson's hawk nestlings fledged later during the last week in July. These preliminary survey data support the recommendation to avoid, whenever possible, the removal of Joshua trees within proposed project areas because they are known to provide an important structural component to the ecosystem and, in the case of raptors, elevated nesting sites.

No active raptor nests were found during the aerial survey, and no raptors were found nesting in any of the 16 historic raven nests which were inspected. Similar ground, vehicle, and aerial surveys will be conducted in FY 1999 to include more regions of the NTS. Monitoring of known raptor nest sites will also begin next year to determine if these sites are repeatedly used.

#### 5.2.2.3 *Chukar*

NDOW did not request permission to trap and remove chukar from the NTS in FY 1998. Therefore, summer brood surveys were not conducted. However, BN biologists recorded all sightings of chukar while performing other field tasks. A few sightings of small groups of chukar (10-30) with young were made in Area 30. Two large groups of nearly full-grown chukar young were observed; one group (>60) around Topopah Spring on July 13 and another group (>100) north of Tippipah Spring in Red Rock Valley on August 20. These sightings indicate that chukar reproduced successfully during 1998, a very good rainfall year.

**Figure 8. Joshua tree (top) and cliff habitats searched for raptor nests (bottom)**

Table 7. Description of raptor nests found on the Nevada Test Site during FY 1998

| Date Nest Found | NTS Area | Nesting Species | Landform | Elevation (m) | Nest Type | Number of Young | Fledge Period[a] |
|---|---|---|---|---|---|---|---|
| June 30 | 19 | American kestrel | Canyon | | Dead hollow tree | >1 | Fourth week of June |
| June 1 | 2 | Barn owl | Piedmont slope | | Manmade vertical shaft | 7 | ND[b] |
| May 20 | 12 | Golden eagle | Cliff | | Cliff stick nest | 1 | Third week of June |
| June 10 | 18 | Prairie falcon | Cliff | | Cliff eyrie | 5 | ND |
| May 5 | 1 | Red-tailed hawk | Piedmont slope | | Joshua tree nest | 3 | First week of June |
| May 7 | 6 | Red-tailed hawk | Piedmont slope | | Joshua tree nest | 2 | Second week of July |
| May 7 | 6 | Red-tailed hawk | Piedmont slope | | Joshua tree nest | 1 | First week of June |
| May 21 | 6 | Red-tailed hawk | Piedmont slope | | Cliff stick nest | 1 | First week of June |
| June 10 | 18 | Red-tailed hawk | Cliff | | Cliff stick nest | ND | ND |
| June 16 | 30 | Red-tailed hawk | Cliff | | Cliff stick nest | 2 | Third week of June |
| June 22 | 15 | Red-tailed hawk | Cliff | | Clif stick nest | 1 | Third week of June |
| June 2 | 2 | Swainson's hawk | Piedmont slope | | Joshua tree nest | 2 | Fourth week of July |

[a]Period during which juvenile birds were observed flying from the nest.
[b]ND - Not determined.

Table 7. Description of raptor nests found on the Nevada Test Site during FY 1998

| Date Nest Found | NTS Area | Nesting Species | Landform | Elevation (m) | Nest Type | Number of Young | Fledge Period[a] |
|---|---|---|---|---|---|---|---|
| June 30 | 19 | American kestrel | Canyon | | Dead hollow tree | >1 | Fourth week of June |
| June 1 | 2 | Barn owl | Piedmont slope | | Manmade vertical shaft | 7 | ND[b] |
| May 20 | 12 | Golden eagle | Cliff | | Cliff stick nest | 1 | Third week of June |
| June 10 | 18 | Prairie falcon | Cliff | | Cliff eyrie | 5 | ND |
| May 5 | 1 | Red-tailed hawk | Piedmont slope | | Joshua tree nest | 3 | First week of June |
| May 7 | 6 | Red-tailed hawk | Piedmont slope | | Joshua tree nest | 2 | Second week of July |
| May 7 | 6 | Red-tailed hawk | Piedmont slope | | Joshua tree nest | 1 | First week of June |
| May 21 | 6 | Red-tailed hawk | Piedmont slope | | Cliff stick nest | 1 | First week of June |
| June 10 | 18 | Red-tailed hawk | Cliff | | Cliff stick nest | ND | ND |
| June 16 | 30 | Red-tailed hawk | Cliff | | Cliff stick nest | 2 | Third week of June |
| June 22 | 15 | Red-tailed hawk | Cliff | | Clif stick nest | 1 | Third week of June |
| June 2 | 2 | Swainson's hawk | Piedmont slope | | Joshua tree nest | 2 | Fourth week of July |

[a]Period during which juvenile birds were observed flying from the nest.
[b]ND - Not determined.

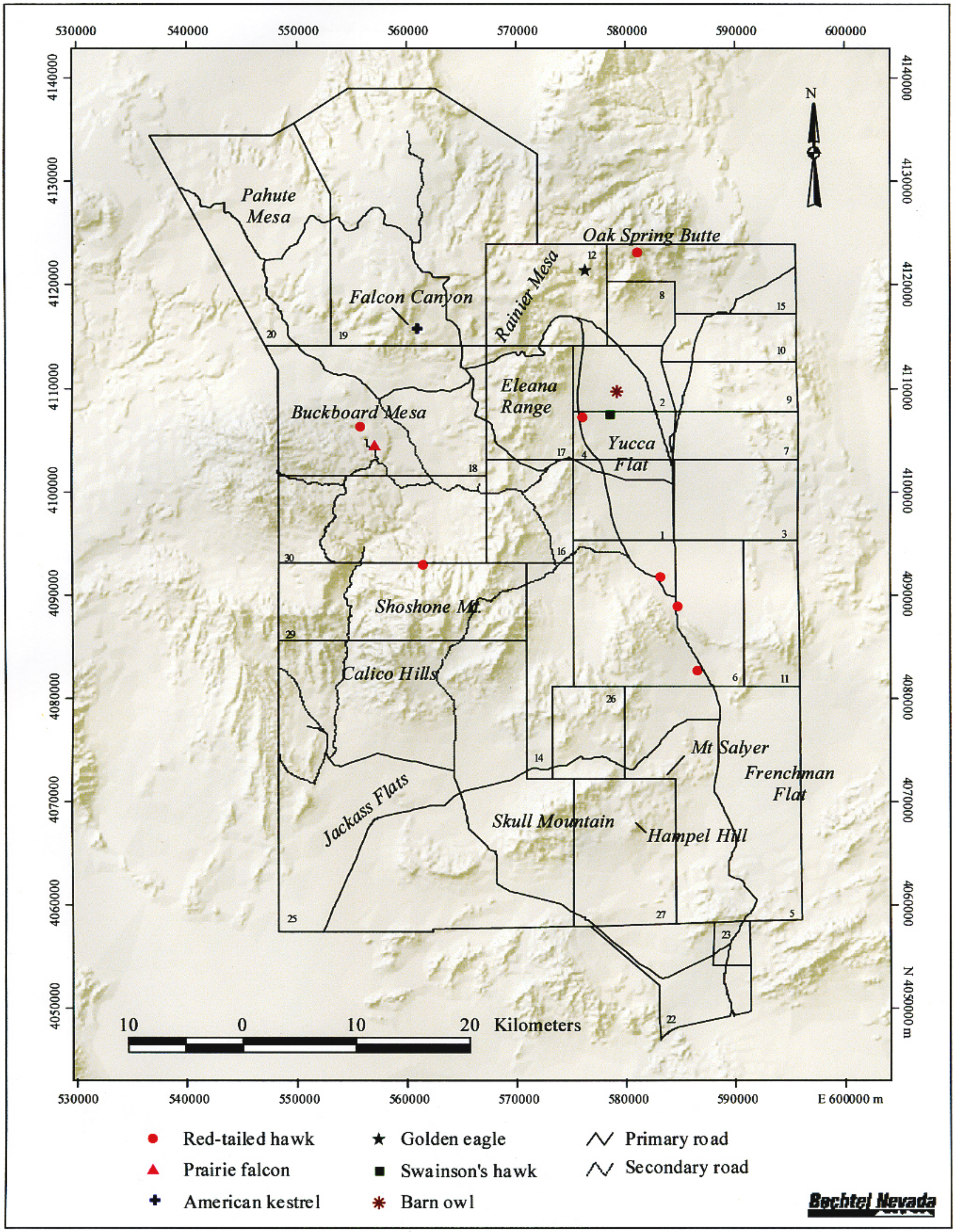



**Figure 9. Locations of active raptor nesting sites on the Nevada Test Site during FY 1998**


**Figure 10. Red-tailed hawk nest in Joshua tree (top) and prairie falcon eyrie (bottom)**

## 5.3 Wetlands and Wildlife Water Sources

### 5.3.1 Task Description

Natural wetlands and man-made water sources on the NTS provide unique habitats for mesic and aquatic plants and animals and attract a variety of other wildlife. Natural NTS wetlands may qualify as jurisdictional wetlands under the Clean Water Act (CWA). Characterization of these mesic habitats to determine their status under the CWA and periodic monitoring of their hydrologic and biotic parameters are components of the EMAC program which were started in FY 1997. Periodic wetlands monitoring may help identify annual fluctuations in measured parameters that are natural and unrelated to DOE/NV activities. Also, if a spring classified as a jurisdictional wetland were to be unavoidably impacted by a DOE/NV project, mitigation for the loss of wetland habitat would be required under the CWA. Under these circumstances, wetland hydrology, habitat quality, and wildlife usage data collected at the impacted spring over several previous years can help to develop a viable mitigation plan and demonstrate successful wetland mitigation.

Man-made excavations constructed to contain water occur on the NTS and also attract wildlife. Along with natural water sources, these man-made sources can affect the movement patterns of some species (e.g., wild horses). However, they can also cause accidental wildlife mortalities from entrapment and drowning if not properly constructed or maintained. Quarterly visits to these water sources were conducted in FY 1998 to document wildlife use and mortality.

### 5.3.2 Task Progress Summary

#### 5.3.2.1 *Monitoring of Natural Water Sources*

**New Wetlands** - BN biologists discovered five new water sources during ecosystem mapping of the northern NTS and during spring monitoring. Four of the water sources appear to be springs and may dry up during drought years or late summer. The fifth water source appears to be an historic borrow pit which catches surface runoff in large enough quantities and for long enough periods to sustain wetland vegetation.

Two of the four springs were found in Area 30 on the southwest bajadas of the Eleana Range. They were named by their discoverer, Kent Ostler, as Wild Horse Spring and Little Wild Horse Spring because abundant signs of horse use, including tracks and scat, were found at both springs. Wild Horse Spring is located in a wash that is about 400 m (1,300 ft) north of another, narrower wash where Little Wild Horse Spring is located. The elevation at both springs is approximately 1,600 m (5,260 ft). The areas around the springs consist mostly of slick rock that lacks soil (Figure 11). Vegetation is restricted to cracks in the rocks and to the bottom of the draws where soil has accumulated. Plant species at the springs and along the wash bottoms consist of Louisiana sagewort (*Artemisia ludoviciana*), seep monkeyflower (*Mimulus guttatus*), willow dock (*Rumex salicifolius*), Sandberg bluegrass (*Poa secunda*), baltic rush (*Juncus balticus*), Utah serviceberry (*Amelanchier utahensis*), and sandbar willow (*Salix exigua*) (no sandbar willow was found at Little Horse Spring). Upland vegetation consisted mostly of big sagebrush (*Artemisia tridentata*), green rabbitbrush (*Chrysothamnus viscidiflorus*), and Nevada jointfir (*Ephedra nevadensis*). No flow measurements were taken at either of these springs, but it was estimated to

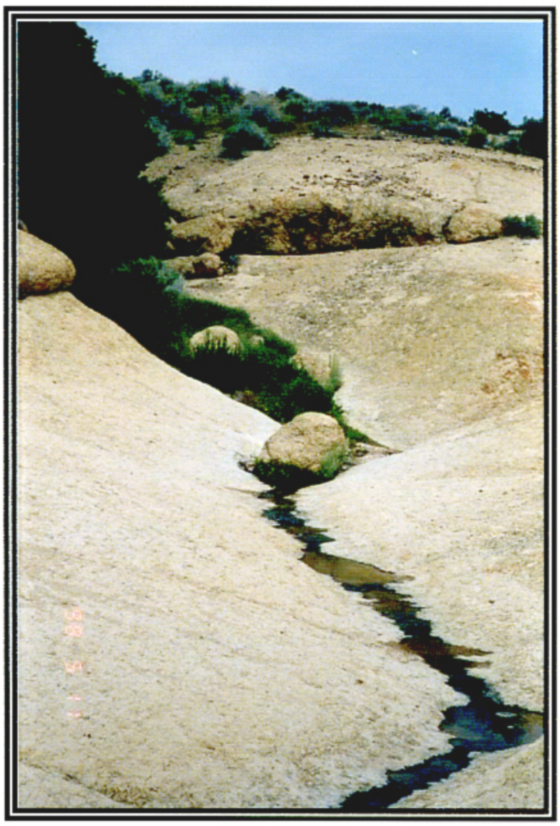



**Figure 11. Wildhorse Seep (top) and Little Wildhorse Seep (bottom) discovered on the Nevada Test Site in FY 1998**

be at least 1 liter/minute (L/min). In June, when the springs were found, water flow from Wild Horse Spring extended down the drainage for approximately 500 m (1,640 ft) while Little Wild Horse Spring had a surface flow which was about 200 m (650 ft) long.

The third spring, also discovered and named by Kent Ostler, is Rattlesnake Seep. It is located in a canyon on the southern edge of Pahute Mesa in Area 19. Plants observed along the drainage consist of Sandberg bluegrass, seep monkeyflower, cheatgrass (*Bromus techorum*), water speedwell (*Veronica anagallis-aquatica*), and algae. Upland species consist primarily of singleleaf pinyon (*Pinus monophylla*), Utah juniper (*Juniperus osteosperma*), big sagebrush, and green rabbitbrush. No flow measurements were taken at this spring, but it was estimated to be < 1 L/min. Flow extended down the canyon intermittently for about 600 m (1,970 ft) (Figure 12).

The fourth spring was found in Area 26 when BN biologists were monitoring the existing Wahmonie Seeps 1, 2, and 3 northeast of Skull Mountain. The new spring, named by its discoverer, Paul Greger, is Wahmonie Seep 4 and is in a wash between Wahmonie Seeps 2 and 3. Wetland vegetation such as *Juncus* sp. was found at the site. In April, when the spring was found, water was flowing northward for 300m (980 ft). Physical and chemical water quality data were collected from this site in April.

The fifth new water source, an ephemeral pond which BN biologists named Pahute Mesa Pond, is on Pahute Mesa adjacent to Dead Horse Flats Road in Area 19. The pond is a depression approximately 30 x 80 m (100 x 260 ft) around its perimeter and 3 m (10 ft) deep on the average. The depression catches and holds precipitation and surface runoff. It appears to have been formed many years ago during excavation of fill material for use in constructing the roadbed for Dead Horse Flats Road. The depression contained water for much of the year in 1998. It dried up in late August. Wetland plants such as *Tamarix* sp. and *Juncus* sp. occur at the site. Although this pond is not a natural seep, spring, or pond, it does support wetland vegetation and may, along with the newly discovered seeps, possess field indicators of a jurisdictional wetland.

An updated map of the natural water sources on the NTS, including the five new sources, was produced (Figure 13). In FY 1999, all five of these new water sources will be characterized to determine if they possess the hydrology, soil, and vegetation indicators that would classify them as jurisdictional wetlands.

**Quarterly Monitoring** – Quarterly monitoring of selected NTS wetlands was continued this FY to characterize seasonal baselines and trends in physical, chemical, and biological parameters. Eight natural water sources were visited three times (winter, spring, summer) between December 1997 and August 1998. They included Cane, Captain Jack, Tippipah, Topopah, Tub, and Whiterock springs, Reitmann Seep, and Yucca Playa Pond. Several other semipermanent water sources, including the four Wahmonie Seeps and Gold Meadows Spring, were visited only once during the year. The physical and chemical water quality data collected from these 13 natural water sources are shown in Table 8. Wildlife use data collected at the majority of these water sources are shown in Table 9.

**Figure 12. Rattlesnake Seep discovered on the Nevada Test Site in FY 1998**

Where measurable, surface flow was detected at all of the seeps during the year (Table 8). Surface flow varied with season, generally increasing from December to March and then decreasing from March to July. Surface flow at White Rock Spring, however, was slightly higher in July than in March, and flows at Reitmann Seep and Tub Spring were barely greater than zero during each visit. Coincident with increased flow, the surface area of standing water also increased substantially at three of the springs during March (Cane, Tippipah, and Whiterock springs). Yucca Playa Pond is the largest natural water source on the NTS, and it remained full from December through September.

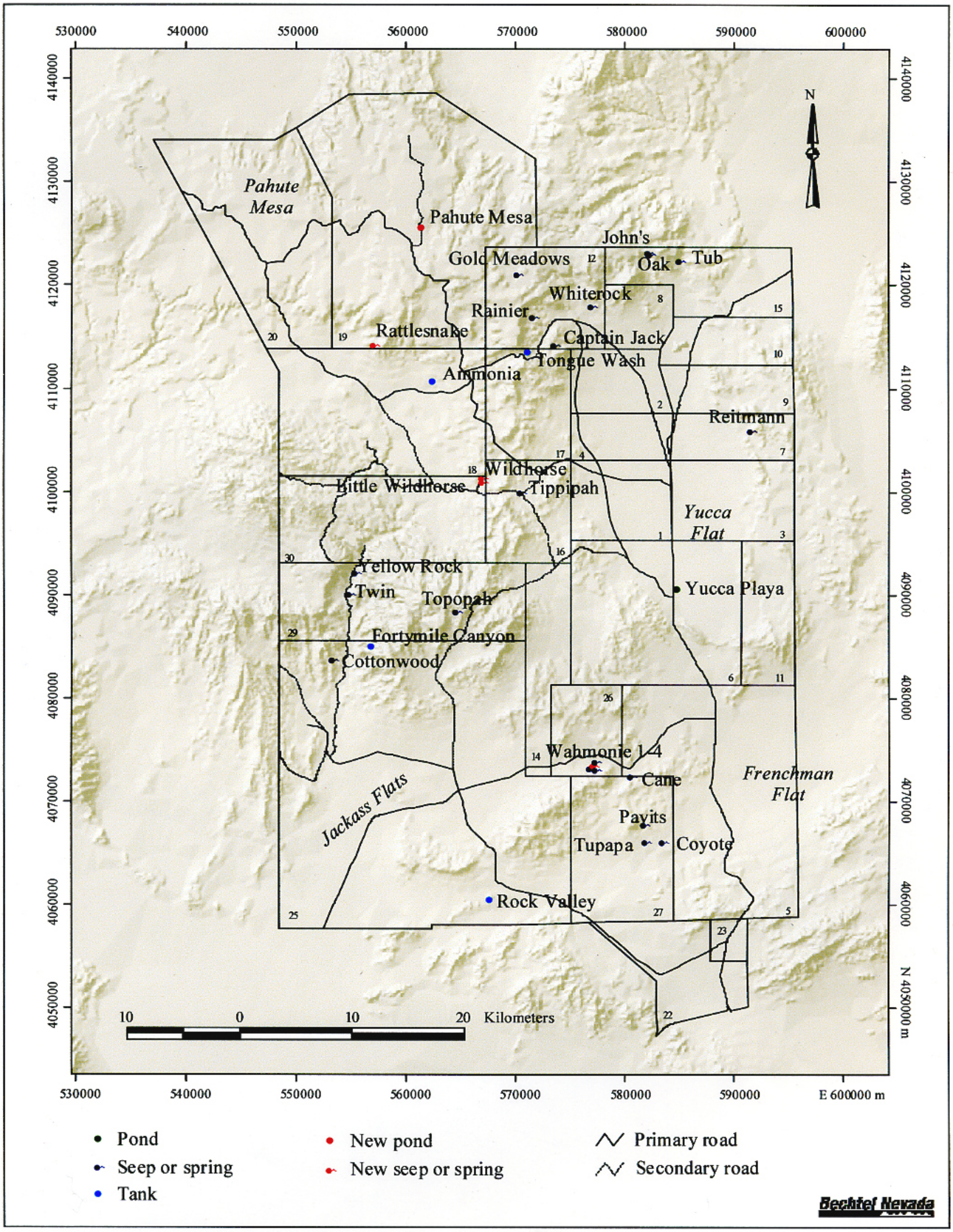



**Figure 13. Natural water sources on the Nevada Test Site**

**Table 8. Seasonal physical and water quality data from selected springs on the Nevada Test Site during FY 1998. Water temperature, dissolved oxygen (DO), total dissolved solids (TDS), conductivity, and pH measures are an average of three replicates**

| Spring | Date | Surface Area of Water ($m^2$) | Surface Flow Rate (L/Min) | Water Temp (°C) | DO (ppm) | TDS (ppm) | Conductivity ($\mu$S) | pH | Maximum Depth (cm) | Disturbance at Spring |
|---|---|---|---|---|---|---|---|---|---|---|
| Cane Spring | 12/17/1997 | 4 | 2.3 | 14.7 | 7.7 | 220 | 443 | 7.0 | 100 | None |
| Cane Spring | 3/18/1998 | 165 | 2.8 | 12.5 | 6.6 | 324 | 645 | 6.8 | 100 | None |
| Cane Spring | 7/14/1998 | 3 | 0 | 16.1 | 6.1 | 223 | 449 | 7.0 | 100 | Cave-in of cave pool |
| Captain Jack Spring | 12/16/1997 | 35 | 1.2 | 5.6 | 8.6 | 100 | 204 | 6.7 | 25 | None |
| Captain Jack Spring | 3/24/1998 | 40 | 4.5 | 10.2 | 14 | 71 | 138 | 7.3 | 27 | None |
| Captain Jack Spring | 7/29/1998 | 8 | 0.6 | 19.1 | 4.6 | 100 | 203 | 7.2 | 22 | Sediment scouring |
| Gold Meadows Spring | 7/8/1998 | 800 | NM[a] | 24.0 | 12.8 | 87 | 177 | 10.5 | 150 | Horse grazing, trampli |
| Reitmann Seep | 12/11/1997 | 1.5 | 0.02 | 7.0 | 10.4 | 449 | 877 | 6.5 | 12 | None |
| Reitmann Seep | 3/24/1998 | 1.5 | O.06 | 19.7 | 12.9 | 321 | 646 | 7.9 | 14 | None |
| Reitmann Seep | 7/9/1998 | 1.5 | 0.03 | 20.4 | 0.25 | 420 | 840 | 7.2 | 20 | None |
| Tippipah Spring | 12/9/1997 | 300 | 2.0 | 10.9 | 2.4 | 121 | 254 | 6.2 | 30 | None |
| Tippipah Spring | 3/18/1998 | 500 | 9.6 | 13.7 | 4.5 | 133 | 2.64 | 6.5 | 30 | None |
| Tippipah Spring | 7/28/1998 | 315 | 6.0 | 17.5 | 0.8 | 140 | 280 | 7.0 | 30 | None |
| Topopah Spring | 12/18/1997 | 3 | 0.2 | 9.6 | 5.4 | 47 | 108 | 7.2 | 15 | None |
| Topopah Spring | 3/31/1998 | 4 | 5.0 | 8.2 | 11.3 | 50 | 99 | 7.1 | 30 | None |
| Topopah Spring | 7/13/1998 | 6 | 0.7 | 14.1 | 5.3 | 70 | 140 | 7.0 | 20 | None |

Table 8 (Continued)

| Spring | Date | Surface Area of Water ($m^2$) | Surface Flow Rate (L/Min) | Water Temp (°C) | DO (ppm) | TDS (ppm) | Conductivity ($\mu$S) | pH | Maximum Depth (cm) | Disturbance at Spring |
|---|---|---|---|---|---|---|---|---|---|---|
| Tub Spring | 12/16/1998 | 0.01 | 0.05 | 9.3 | 6.3 | 150 | 302 | 6.9 | 5 | None |
| Tub Spring | 3/24/1998 | 0.06 | 0.05 | 24.2 | 3.1 | 130 | 267 | 7.0 | 3 | None |
| Tub Spring | 7/9/1998 | 0.01 | 0.03 | NC[b] | NC | NC | NC | NC | 2 | None |
| Wahmonie Seep No. 1 | 4/8/1998 | 10 | 3.7 | 11.3 | 2.3 | 349 | 697 | 7.0 | 2 | None |
| Wahmonie Seep No. 2 | 4/8/1998 | 8 | 2.4 | 12.6 | 7.5 | 250 | 493 | 8 | 12 | None |
| Wahmonie Seep No. 3 | 4/8/1998 | 40 | 1.4 | 7.5 | 10.2 | 374 | 747 | 7.8 | 15 | None |
| Wahmonie Seep No. 4 | 4/8/1998 | 180 | 4.2 | 14.3 | 7.0 | 192 | 382 | 7.6 | 20 | None |
| Whiterock Spring | 12/16/1997 | 23 | 1.9 | 7.1 | 5.0 | 107 | 205 | 6.8 | 28 | None |
| Whiterock Spring | 3/19/1998 | 600 | 3.3 | 10.6 | 7.0 | 126 | 233 | 7.2 | 38 | None |
| Whiterock Spring | 7/8/1998 | 150 | 3.6 | 17.7 | 2.3 | 153 | 304 | 7.0 | 25 | None |
| Yucca Playa Pond | 12/18/1997 | 23,000 | NM | 4.5 | 8.6 | 153 | 313 | 7.7 | NC | None |
| Yucca Playa Pond | 5/4/1998 | 23,000 | NM | 15.3 | 9.8 | 168 | 335 | 7.6 | NC | None |
| Yucca Playa Pond | 7/14/1998 | 23,000 | NM | 23.6 | 6.0 | 271 | 536 | 8.5 | NC | None |

[a]NM - Not measureable due to diffused flow.
[b]NC - Data not collected.

**Table 9. Seasonal wildlife use at selected springs on the Nevada Test Site during FY 1998. P = species present, inferred from sign**

| Wildlife Observed | Cane Spring | | | Captain Jack Spring | | | Gold Meadows Spring | Reitmann Seep | | | Tippipah Spring | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Mammals** | 12/17 | 3/18 | 7/14 | 12/16 | 3/24 | 7/29 | 7/8 | 12/11 | 3/24 | 7/9 | 12/9 | 3/18 | 7/28 |
| Coyote (*Canus latrans*) | P | P | | | | | | P | P | | P | P | |
| Cottontail rabbit (*Sylvilagus audubonii*) | | | | | | | | | | | | 1 | |
| Feral horse (*Equus caballus*) | | | | | P | P | P | | | | | | |
| Mule deer (*Odocoileus hemionus*) | | | P | | P | | P | P | | | P | | |
| Ground squirrel (*Ammospermophilus leucurus*) | | | | | | | | | | | | | |
| **Birds** | | | | | | | | | | | | | |
| American robin (*Turdus migratorius*) | | | | | | | 1 | | | | | | |
| Black-headed grosbeak (*Pheucticus melanocephalus*) | | | | | | | 1 | | | | | | |
| Black-throated sparrow (*Amphispiza bilineata*) | | | >15 | | | | | | | | | | |
| Chukar (*Alectoris chukar*) | | | | | 2 | | | | | | | | |
| Cooper's hawk (*Accipiter cooperii*) | | | | | | | | | | | | | |
| Common raven (*Corvus corax*) | | 1 | 1 | 1 | | | | | | | | 1 | |
| Gambel's quail (*Callipepla gambelii*) | | | >15 | | | | | | | | | | |
| House finch (*Carpodacus mexicanus*) | | 5 | | | | | >10 | | | >10 | | | |
| Killdeer (*Charadrius vociferus*) | | | | | | | 1 | | | | | | |
| Long-eared owl (*Asio otus*) | 6 | | | | | | | | | | | | |
| Mourning dove (*Zenaida macroura*) | | | >300 | | | >20 | >40 | | | >15 | | | >50 |
| Mountain bluebird (*Sialia currucoides*) | | | | | | | 1 | | | | | | |
| Northern harrier (*Circus cyaneus*) | | | 1 | | | | | | | | | | |
| Prairie falcon (*Falco mexicanus*) | | | | | | | 1 | | | | | | |
| Say's phoebe (*Saya saya*) | | | | | | | | | | | | | |
| Violet-green swallow (*Tachycineta thalassina*) | | | | | | | 2 | | | | | | |
| Western meadowlark (*Sturnella neglecta*) | | | | | | | | | | | | | |

Table 9. (Continued)

| Wildlife observed | Topopah Spring | | | Tub Spring | | | Wahmonie Seep #1 | Wahmonie Seep #4 | Whiterock Spring | | | Yucca Playa Pond | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Mammals** | 12/18 | 3/31 | 7/13 | 12/16 | 3/24 | 7/9 | 4/8 | 4/8 | 12/16 | 3/19 | 7/8 | 12/18 | 5/4 | 7/1 |
| Coyote (*Canus latrans*) | | | | | P | | | P | | | | P | | |
| Cottontail rabbit (Sylvilagus audubonii) | | | | | | | | P | | 1 | | | | |
| Feral horse (*Equus caballus*) | | | | | | | | | | | | | | |
| Mule deer (*Odocoileus hemionus*) | | | | P | | | | P | P | | | | | P |
| Ground squirrel (*Ammospermophilus leucurus*) | | | | 1 | | | | | | | | | | |
| **Birds** | | | | | | | | | | | | | | |
| American robin (*Turdus migratorius*) | | | | | | | | | | | | | | |
| Black-headed grosbeak (*Pheucticus melanocephalus*) | | | | | | | | | | | | | | |
| Black-throated sparrow (*Amphispiza bilineata*) | | | | | | | | | | | | | | |
| Chukar (*Alectoris chukar*) | P | P | >60 | P | | | | | | | | | | |
| Cooper's hawk (*Accipiter cooperii*) | | | | | | | | | 1 | | | | | |
| Common raven (*Corvus corax*) | | | | | | 2 | | | 1 | | | | | |
| Gambel's quail (*Calipepla gambelii*) | | | | | | | 12 | 3 | | | | | | |
| House finch (*Carpodacus mexicanus*) | | | >20 | | | | | | | | | | | |
| Killdeer (*Charadrius vociferus*) | | | | | | | | | | | | | | |
| Long-eared owl (*Asio otus*) | | | | | | | | | 4 | | 2 | | | |
| Mourning dove (*Zenaida macroura*) | | | >40 | | | >2 | | | | | >30 | 2 | | >20 |
| Mountain bluebird (*Sialia currucoides*) | | | | | | | | | | | | | | |
| Northern harrier (*Circus cyaneus*) | | | | | | | | | 1 | | | | | |
| Prairie falcon (*Falco mexicanus*) | | | | | | | | | | | | | | |
| Say's phoebe (*Saya saya*) | | | 1 | | | | | | | | | | | |
| Violet-green swallow (*Tachycineta thalassina*) | | | | | | | | | | | | | | |
| Western meadowlark (*Sturnella neglecta*) | | | | | | | | | | | | | 1 | |

Most water quality parameters varied between sites and with season (Table 8). As expected, water temperature was lowest in December or March and highest in July at all sites (range of 4.5 to 24 °C [40 to 75 °F). Total DO ranged from <0.8 parts per minute (ppm) at Tippipah Spring to 14 ppm at Captain Jack Spring. Levels of DO at five springs showed a moderate increase from December to March followed by a decline in July (Table 8). DO levels were rather constant at Cane Spring. The lowest DO levels were measured during July at Reitmann, Tippipah and Whiterock springs. TDS were moderately low at all springs across seasons (range of 47 to 449 ppm). Measurements of pH ranged from 6.2 at Tippipah Spring to 10.5 at Gold Meadows Spring.

As in 1997, three locations had some limited physical disturbance (Cane, Captain Jack, and Gold Meadows Springs). A soil cave-in at the cave pool opening at Cane Spring occurred during or prior to July, and some grazing and trampling of vegetation by horses occurred at the other two springs. Natural scouring at Captain Jack Spring from summer rains also removed a moderate amount of soil fines from the outflow channel leaving the existing bedrock exposed for a distance of about 15 m (50 ft).

Samples of aquatic invertebrate were collected at eight springs during 1998. These include Cane, Captain Jack, Gold Meadow, Tippipah, Topopah, and Whiterock Springs, Reitmann Seep, and Yucca Playa Pond. The samples were fixed and preserved for later processing and identification. They are collected annually to develop a complete inventory of the invertebrate species living in the NTS natural water sources.

Five species of mammals and 17 species of birds were detected at eleven water sources (Table 9). The most abundant and widely distributed species was the mourning dove, observed at nine sites. Seasonal use of water sources is dominated by mourning doves during the summer. The largest groups of doves were observed in July at Cane Spring and Yucca Playa Pond. Chukar were most abundant at Topopah Spring.

#### *5.3.2.2 Monitoring of Man-Made Water Sources*

BN biologists conducted quarterly monitoring of man-made water sources. These sources, located throughout the NTS (Figure 14), include 35 plastic-lined sumps, 46 sewage treatment ponds, 13 unlined well ponds, 2 cement-lined ponds, and 4 radioactive containment ponds. Several ponds or sumps are located next to each other at the same project site. They are monitored to assess their use by wildlife and to develop and implement mitigation measures to prevent them from causing significant harm to wildlife. Many NTS animals rely on these man-made structures as sources of free water. Wildlife and migratory birds may drown in steep-sided or plastic-lined sumps as a result of entrapment, or ingest contaminants in drill-fluid sumps or evaporative ponds. Mitigation measures, required under the Mitigation Action Plan for the *Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada* (DOE, 1996), include placing flag lines over contaminated water sources to repel birds, or fencing or covering them. Quarterly monitoring ensures that all flag lines, fencing, or covers are checked for their integrity and repaired when needed.

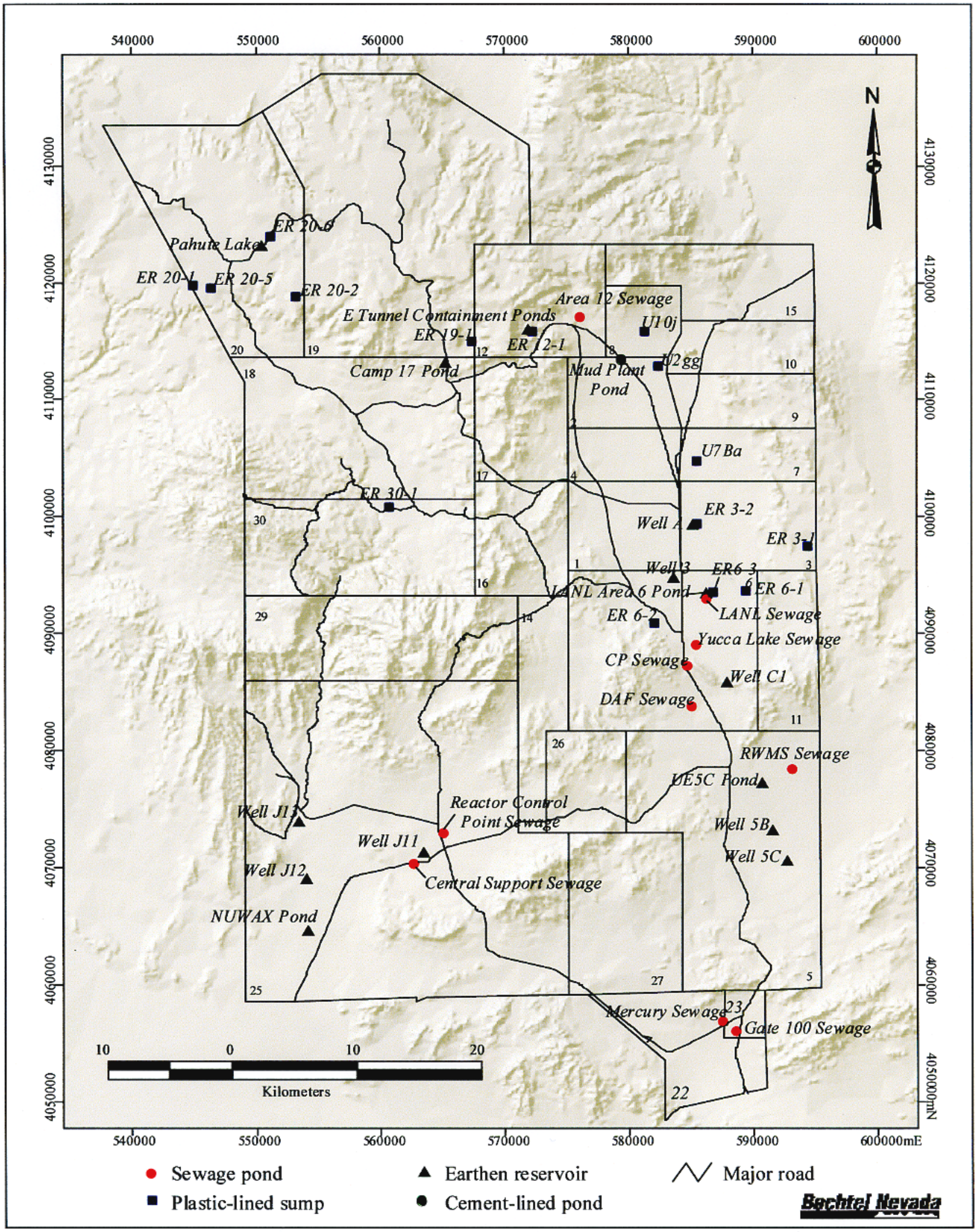



**Figure 14. Man-made water sources monitored for wildlife use and mortality on the Nevada Test Site during FY 1998**

Man-made water sources were visited during four quarterly sampling periods: November, February-April, May-June, and September. At each site, a BN biologist recorded the presence or absence of standing water and the presence of animals or their signs around the water source. At plastic-lined sumps, the biologist also estimated the surface area of water and the presence, absence, and condition of fences and flag lines. Some types of ramps or ladders, which allow animals to escape if they fall in, have also been installed at many plastic-lined sumps, and the presence, absence, and condition of these structures were also noted. All dead animals (or any remains of an animal) in or adjacent to a man-made water source were recorded. All survey observations were summarized in quarterly reports that were submitted to DOE/NV (BN, 1997c; 1998d; g; k; o).

Use of unlined sumps and ponds by migratory birds and mammals such as coyotes and deer was common. Only one man-made pond (Camp 17 Pond in Area 18) was used this year by wild horses, whereas last year both the Camp 17 Pond and the Mud Plant Pond in Area 2 were used. The fences installed around the plastic-lined sumps do not exclude coyotes or deer, as their tracks were observed commonly inside many of the fences. Birds were observed much less at the plastic-lined sumps compared to the unlined ponds.

No animal mortalities from drowning or entrapment were observed during the surveys at any of the water sources. However, during the May-June sampling, 12 dead doves were observed at the Device Assembly Facility sewage ponds. It was determined through subsequent field observations that the doves were being killed by a pair of nesting red-tailed hawks within 1.5 km (0.9 mi) of the sewage ponds.

# 6.0 HAZMAT SPILL CENTER MONITORING

## 6.1 Task Description

Biological monitoring at the HAZMAT Spill Center on the playa of Frenchman Lake in Area 5 is required for certain types of chemicals under the center's programmatic Environmental Assessment. These chemicals have either not been tested before, have not been tested in large quantities, or have uncertain modeling predictions of downwind air concentrations. In addition, ESHD has requested that BN monitor (downwind) any test which may impact plants or animals off the playa.

A document entitled *Biological Monitoring Plan for Hazardous Materials Testing at the Liquefied Gaseous Fuels Spill Test Facility on the Nevada Test Site* was prepared in FY 1996 (BN, 1996) and describes how field surveys will be conducted to determine test impacts on plants and animals and verify that the spill program complies with pertinent state and federal environmental protection legislation. The design of the monitoring plan calls for the establishment of three control transects and three treatment transects at three distances from the chemical release point which have similar environmental and vegetational characteristics. In FY 1998, EMAC funded the baseline sampling of the control transects. BN biologists are tasked to review spill test plans to determine if field monitoring along the treatment transects is required for each test as per the monitoring plan criteria. All test-specific field monitoring is funded through the HAZMAT Spill Center.

## 6.2 Task Progress Summary

In FY 1998, seasonal sampling of the control and treatment transects surrounding the HAZMAT Spill Center were conducted in March and September. Treatment transects are each 1,000 m (3,280 ft) long and at three distances (1, 3, and 5 km [0.6, 1.9, and 3.1 mi]) downwind from the spill site. Control transects are similar lengths and at similar distances upwind. Data collected included the presence of any dead animals, observations of wildlife or their signs (i.e., scat, burrows, nests, tracks), and any damage to vegetation. Data was entered into an Access™ database and verified.

BN reviewed chemical spill test plans for three experiments: (1) Mountain Lion Test Series by the Remote Sensor Test Range Program testing 40 chemicals and 28 materials, (2) Dupont Specialty Chemicals' Fuming Acids Mitigation Workshop using 5 chemicals, and (3) Compressed Gas Mitigation Workshop using ammonia of varying spill volumes . Letters documenting these reviews were submitted to ESHD on March 2 , March 24, and July 21, 1998 (BN, 1998b; e; m).

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# 7.0 GENERAL BIOLOGICAL SUPPORT

## 7.1 Task Description

General EMAC program support is provided and includes preparation of work scope and budget plans for outgoing years, and tracking and reporting current FY program tasks and costs. Ancillary maintenance of biological permits and facilities to perform EMAC tasks are included as well. NERP support that is provided through EMAC includes on-site biological, logistical, and administrative assistance, upon request from ESHD to NERP investigators. Assistance may include providing Q-cleared escorts, a photographer, or a guide to particular biological study sites; conducting desert tortoise conservation training; and assistance in obtaining property removal passes. Field radios and laboratory space for NERP investigators are also included.

## 7.2 Task Progress Summary

In January, portions of the 1997 Annual Site Environmental Report (ASER) which pertain to wildlife and ESA permits, ESA compliance activities, and ecological monitoring were prepared. In August, progress reports on ESA compliance, ecological monitoring, and land reclamation on the NTS were written for the ASER first quarter calendar year 1998 progress report. All portions of the ASER were submitted to BN Analytical Services, Environmental Monitoring Group, for technical editing and publication.

NERP support was provided, as requested from ESHD, to Phil Medica of the National Biological Service in June to capture and measure tortoises located in the Rock Valley enclosures. In the summer, a BN biologist escorted a University of Reno Ph.D. graduate student to Frenchman Flat to establish small mammal trap grids for her dissertation research and provided administrative assistance and use of the laboratory and office facilities in Building 790 in Mercury, as needed.

The BN annual scientific animal handling and collection permit from NDOW (number S15842) was renewed in January. Also, BN prepared and submitted to NDOW in January a report of all collection activities conducted during calendar year 1997.

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